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ORIGINAL MEMOIRS.

OBSERVATIONS ON THE RESULTS IN 125 CASES OF SARCOMA.¹

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THE subject of sarcoma still remains a fruitful field for investigation both by the pathologist and the surgeon. We are absolutely in the dark as regards its etiology, and as to its prognosis and treatment we are but little farther advanced than were our colleagues a quarter of a century ago. Perhaps we now appreciate more fully the importance of traumatism as an occasional exciting cause. More than this, however, we cannot claim, for we must acknowledge, I think, that the painstaking and excellent work done in some of our laboratories in an endeavor to explain the etiology of malignant tumors has been rather disappointing in its results, certainly, at least, as far as sarcoma is concerned.

It is apparent, certainly to the practical surgeon, that at the present time tumors varying greatly in their characteristics are classed under the general name of sarcomata. Under this title are still included certain new growths which will probably

¹ Read in part at the New York Surgical Society, April 13, 1904.

in a few years be removed to a distinct class by themselves. We know, also, with what hesitation the pathologist pronounces upon certain growths which are merely suspicious of or resemble sarcoma. He is often at a loss to distinguish sarcoma from masses of granulation tissue or the resulting cellular tumor. I have no doubt but that in another quarter of a century the class of neoplasms now known as sarcomata will be divided into many other distinctive groups, very probably with entirely new names. It had seemed to me that our knowledge of carcinoma, at least as regards its pathology, was more definite; yet we find that the chief of the London Cancer Research Committee, Dr. Snow, has come to conclusions almost identical with the views just expressed. The endothelioma is also a puzzling variety of malignant tumor. Its exact position is still in doubt, and we do not as yet know whether to class it under the carcinomata, sarcomata, or in a distinct class of its own.

The diagnosis as well as the prognosis of any malignant tumor will always to a large extent depend on the microscopical examination. In regard to many neoplasms, such an examination is exact and trustworthy. In a large measure this is also true as regards sarcomata; but at the same time I think that most of us feel that the microscopical report in this class of tumors cannot be fully relied upon, but that the clinical picture is also sometimes needed in order to arrive at a positive decision concerning the exact nature and malignancy of the growth. As an example, let me refer to enlargements or growths of the lymphatic glands. Every surgeon is aware how unsatisfactory are often the results of the microscopical examination of such tissues. In two of the cases to be reported in the series which forms the basis of this paper, the glands removed were reported by an expert pathologist to be chronic lymphadenitis; and yet one of these patients died of sarcoma, and in the other a second examination resulted in the verdict of lymphosarcoma. There seem to be certain glandular tumors where it is apparently impossible for the pathologist to arrive

at a definite conclusion as to their exact nature, whether the growth is the result of chronic inflammation, tuberculosis, malignant lymphoma, Hodgkin's disease, or sarcoma. This whole subject is at the present day so vague and unsatisfactory, that I do not know a richer field for research, and I have been surprised that more of our younger clinicians and pathologists have not persevered in their investigations of this subject.

Another example of this difficulty in reaching a diagnosis is found in that class of neoplasms whose main structure is that of a fibroma, and yet which at the same time borders on sarcoma. The latter unquestionably develops from degeneration of the former, but in what class of fibromata this change is apt to occur we are much at a loss to understand. In the 125 cases mentioned below, the distinct diagnosis of fibroma was made in three patients who eventually developed sarcoma of a malignant type. There are also four other cases where the microscopical examination of the tumor indicated a sarcoma engrafted upon a pure fibroma. Dr. Cullen, of Baltimore, writes me that he has found such changes to occur in a considerable proportion of his uterine fibromata.

The next most important object of our search is the means of rendering a reliable prognosis. Of course, as already stated, to a large extent the basis of this must be the microscopical examination, but along with this must be studied the clinical course of the case. It seems to me that the study of such a combination, in a large series of cases, ought to throw more light than we now possess on this important subject. The difference in the degree of malignancy of sarcomatous tumors varies greatly. As we know, the progress of some cases is exceedingly rapid, so that but a few months may elapse between the first appearance of the symptoms and death. For example, in our series of cases, we find the total duration of symptoms in one case to have been but three months, and in quite a number of others less than a year.

On the other hand, the progress of some cases is very slow, so that for years the tumor may remain almost inactive,

both as regards its growth and its malignant influence on the patient's organization. Thus, in our series there are a number of cases where the tumor has increased so slowly that at the end of four or five years its size has been very moderate, also other cases where for a number of years no increase in growth has been noticed. From the statistics that follow, it will be seen that this difference in the rapidity and morbidity is to a considerable extent dependent on the variety of sarcoma to which the tumor belongs. It is not always so, however, for we find that tumors, whose structures seem to our pathologists to be practically similar, will vary greatly in both these respects. For instance, in our series we find in one patient a small round-celled sarcoma of a thigh, of a variety rightly considered to be one of the most malignant, which for a period of years developed very slowly, and yet in other patients we find tumors of the same variety producing death within a few months. Neither can it be said that this variance is due entirely to location, for we may find in two patients similar tumors of the same organ exhibiting the greatest difference in their malignancy.* It is also recognized that often the malignancy of sarcoma will vary greatly at different epochs of its existence. We encounter cases where for years the tumor may remain almost stationary, and be practically non-malignant, when suddenly it assumes a rapid rate of growth and an intense malignancy without any appreciable reason for such a change. This is especially apt to occur in the class known as fibrosarcoma. It is not uncommon for a fibromyoma of the uterus, after a dozen or more years of a benign and comparatively harmless existence, to suddenly assume the most malignant character, and on removal it is called a fibrosarcoma. The moment of this change or its cause cannot usually be ascertained.

What we as surgeons specially seek is more, however, than the name and classification of the neoplasm. We are most in search of a better means of cure than we now possess,

* Further discussion of this subject will be found in an article by Dr. George A. Tuttle and myself in the American Journal of Medical Sciences.

but that seems at present far out of our reach. We must grant, however, that sarcoma is occasionally cured by an attack of erysipelas, by Coley's toxins, by free and prolonged suppuration, and possibly by X-ray treatment or radium. Of these the most encouraging is probably Coley's toxins. It must be confessed, however, that, in spite of exceptional cures accomplished by the use of one or other of these remedies, our main reliance still lies in thorough and early removal of the tumor by operation. In the following two cases the cure which resulted was due apparently to free suppuration.

CASE I.—M. J. D., female, aged thirty-two years, on February, 1892, injured her shoulder. It was thought that a fracture of the head of the bone had resulted. A week or so later a tumor of considerable size developed at the shoulder, which soon after "broke," and continued to discharge a thin purulent fluid. Four weeks after the injury, a section removed proved the growth to be a small round-celled sarcoma. It was thought that amputation at the shoulder-joint would suffice; but when the humerus was disarticulated, it was found that the growth had infiltrated into the acromion process for a considerable distance, as well as into the adjoining soft parts. As permission had not been granted for a more extensive operation, after the removal of the arm the cavity was packed and the flaps loosely drawn together. There remained in the scapula as well as adjacent tissues a mass of sarcoma in bulk representing a large hen's egg. The patient would not give her consent to a complete removal of the shoulder. Consequently, a bad prognosis was given, and for a time the patient disappeared from view. When seen six months later the wound in the shoulder was thoroughly cicatrized. Suppuration had continued for about three months, at first being very free, but gradually diminishing. The patient entirely regained her health, and three and one-half years after the amputation was perfectly well. Soon after this she died of sepsis due to an abortion.

CASE II.—A. L., male, aged thirty-three years. No syphilitic history. No distinct history of an injury. In May, 1888, patient began to experience abdominal pain. In August, a tumor the size of a cocoanut was discovered in the inguinal region. At operation it was found to be retroperitoneal. For two years afterwards the

patient felt well. He then experienced pains in his inguinal region, and a tumor again developed. In February, 1891, the second operation was performed, and was very extensive. The wound was left partially open, considerable gauze packing being needed on account of the bleeding. For a period of three months the sinus continued to discharge. It then healed, and the man up to March, 1900, remained perfectly well. He had gained forty pounds in weight.

CASE III.—Female, aged twenty-six. In October, 1902, a tumor the size of a grape fruit was removed by myomectomy; at the time it was thought to be a fibromyoma, December 13, 1902. The specimen consists of two solid masses of tissue hardened in alcohol. Each shows an outer envelope, five to ten millimetres in thickness, along one edge, corresponding evidently to the muscular wall of the uterus. Beneath this the tumor mass, which is about three centimetres thick, presents an irregular, somewhat cauliflower-like inner margin. None of the uterine mucosa can be recognized. Much of the cut surface of the tumor has a fasciculated appearance, as in myomata, but in general less sharply defined than in the latter. Parts of the surface are gray, homogeneous, especially near the uterine wall. Here the generally firm consistence of the growth seems to have given place, in part, to a softer consistence, indicated by a tendency to break down into irregular channels or splits, which may be artificial. There are a few small, translucent, œdematous areas.

Microscopical Examination.—The tumor is a compact mass of cells, with very little, often no intercellular, fibrillated substance. The cells are predominantly fusiform, but with much diversity in size, shape, and other features. There is no fibrous capsule of the tumor, and, although the line of separation between tumor and uterine wall appears sharp with the low power, there is more intimate relation between the peripheral tumor cells and the myometrium than is usual in myomata.

Parts of the sections, especially the central parts, have the structure of a pure myoma, being composed of interlacing bundles of smooth muscle-fibre cells with elongated, oval, nuclei containing distinct nucleoli and long, narrow, ribbon-shaped or fusiform cell-bodies staining with eosin. These cells are in close apposition, with scarcely any recognizable basement substance. There is no

tendency to the hyaline metamorphoses so common in ordinary uterine myomata.

The most interesting feature of the tumor is the transformation of the muscular into sarcomatous tissue. This transformation occurs with irregular distribution in many parts of the tumor, but is especially well marked in the periphery near the uterine wall, where whole fields show only sarcomatous cells. The metamorphosis of the muscle-cells into sarcoma cells can be clearly traced through all transitional stages, and is characterized by the substitution of the former cells by the latter. There are no interstitial cells from which the sarcoma cells could be derived.

These sarcoma cells are quite polymorphous and generally have large vesicular nuclei with nucleoli. Large and small fusiform cells, angular, polyhedral cells, cells with short processes, round and oval cells, and giant cells occur. Cells with gigantic nuclei and cells with many nuclei occur, also distorted, deeply staining nuclei, vacuolated nuclei, and cytoplasm, etc. Notwithstanding this diversity of cells, the prevailing type of the sarcomatous areas is spindle-celled. A common change in the muscle-cells of the tumor is swelling of the nucleus, with increase in the diameter and diminution in the length of the cell-body, which assumes a deep eosin staining. Nuclear figures, though not abundant, can be recognized. The giant cells, which are a striking feature, seem to result from coalescence of cells. There is in general more intercellular substance in the sarcomatous than in the myomatous areas. There are a few small oedematous areas resembling mucoid tissue, and also some dilated lymphatic vessels.

The tumor is fairly rich in blood-vessels, but only the arteries and veins have a little connective tissue in their outer wall; the capillary endothelium is immediately surrounded with the tumor cells. There is a well-marked endarteritis of the vessels in the periphery of the tumor and the adjacent muscular wall of the uterus. There are no regressive, degenerative changes in the tumor cells, except as they may be indicated by the distorted nuclei with irregular staining. The muscle-cells belonging to the uterine wall take no part in the formation of the sarcoma cells, with which, however, they are in close apposition. They atrophy and undergo hyaline metamorphosis, their place being taken by the advancing tumor cells, which in this way manifest their invasive character.

Diagnosis.—Myoma sarcomatodes (sarcomatosum) uteri.

Remarks.—Virchow, in his work on tumor cells, calls attention to the transformation of myoma into sarcoma, and derived the sarcoma cells from the connective-tissue cells. The direct metaplasia of the smooth muscle-fibre cells of a myoma into sarcoma cells is now generally recognized since the investigations on this point of v. Kahlden (Ziegler's *Beiträge*, Band xiv), and especially of Whitbridge Williams (*Zeitschr. für Heilkunde*, 1894) and of Pick (*Archiv für Gynäkologie*, 1895, two articles in successive volumes). The present specimen is an excellent and very typical example of this. There is some dispute as to whether the tumor shall be called a sarcomatous or sarcomatoid myoma; for the discussion of this point, see the papers by Williams and Pick.

The tumor is likely to recur, and it may metastasize into the lungs and into the abdominal cavity. It is to be ranked as malignant.

The consideration of certain of these points can be best advanced by a detailed report of a large series of cases. The narration of an unusual case is always full of interest, and certainly adds to our knowledge; but what seems to me more instructive is the report of a man's entire experience.

It has been my endeavor in this paper to study some of the important facts concerning 125 cases of sarcoma which have been under my personal care, and from whom, either by a supposedly radical operation or by a minor procedure for mere diagnosis, a sufficient bulk of tumor has been obtained to enable the pathologist to render a positive opinion as to its character. Doubtful cases have not been included, neither have cases where, although the clinical course was characteristic of sarcoma, the microscopical examination was lacking. The examinations have all been made by clever and well-known pathologists. The great majority of the cases occurred in the Presbyterian Hospital, New York, where the examinations have been made by Dr. John Thacher and Dr. George A. Tuttle, to whose courtesy I am indebted for many of these reports. The cases number 125. These are divided according to region attacked and variety of tumor, as follows:

	Giant Cell.	Spindle Cell.	Small Round Cell.	Round Cell.	Myxosarcoma.	Lymphosarcoma.	Fibrosarcoma.	Unclassified Sarcoma.	Mixed Tumors.	Total.
Skin (single).....	1	..	..	1
Scalp	2	..	..	2
Brain	1	4	..	..	..	1	..	..	6
Face	2	1	..	..	..	..	..	3
Facial bones (not jaws)	3	..	3
Superior maxilla }	10	3	..	..	..	..	2	3	..	18
Inferior maxilla }										
Submaxillary gland.....	1
Parotid	2	..	1	..	..	..	..	1	3
Larynx	1	..	..	..	..	..	..	1
Glands of neck.....	4	..	..	9	..	3	1	17
Thoracic wall.....	5	..	1	..	..	1	..	7
Breast.....	1	..	..	..	1	..	1
Axilla.....	3	..	..	..	..	..	..	3
Shoulder.....	1	..	1	..	..	..	..	2	..	2
Arm.....	1	..	..	..	..	..	..	1
Intraperitoneal.....	1	1	..	..	..	1	..	3
Retroperitoneal.....	..	1	..	1	..	1	2	4	..	9
Kidney	1	..	1	..	..	..	..	..	2
Testis	2	1	..	..	..	..	..	3
Uterus	2	..	..	..	..	4	2	..	8
Ovary	1	..	..	1	..	2
Spine	4	..	..	..	..	1	..	5
Nerves	1	..	..	1	..	1
Buttocks.....	1	..	..	..	..	1
Thigh	1	2	..	..	..	..	4	..	7
Leg	1	2	..	..	..	..	1	1	..	4
Toe.....	1	..	..	1
Multiple.....	3	..	..	1	4	..	8
Total	12	13	29	11	3	10	14	31	2	125

Sex.—Females, 60 cases; males, 65 cases.

Age.—1 to 10 years, 5 cases; 10 to 20 years, 9 cases; 20 to 30 years, 31 cases; 30 to 40 years, 41 cases; 40 to 50 years, 22 cases; 50 to 60 years, 17 cases.

The minimum age was 4½ years (small round-celled sarcoma).

The maximum, 58 years, 2 cases (1 small round and 1 fibrosarcoma).

From these figures it will be seen that the greatest number of cases occurred between the ages of thirty and forty years. This is not quite in accord with some of the notions that prevail that sarcoma mainly develops in young adults.

Out of the 125 cases, twenty-seven have been lost sight of, ninety-eight have been followed; of these, fifty-one have died of recurrence or metastasis. The average duration of life of these fifty-one patients from the appearance of the first symp-

tom until death was twenty-five months,—the maximum being ninety-six months, the minimum four months. Five other patients have recurrences or metastases, and are still alive, but are doomed to an early death. Two other patients, while free from recurrence, have too recently undergone operation to be of value in any conclusions as to prognosis. Thirty-nine patients have survived the operation for one year or longer.

Of the ninety-eight patients whose after history is known, in fifty-six the operation was considered complete. In forty-two it was recognized as incomplete. In a certain proportion of the latter, an attempt was made to eradicate the neoplasm, but was found impossible because of its extensive infiltration or adhesions. In one of these cases recovery has resulted (see Case I). In other cases removal was evidently out of the question, and in those a section was taken from the growth for microscopical examination.

Of the fifty-six complete (?) operations, fourteen have died of recurrences or metastases. Thirty-eight are alive and well at the end of a year. As already stated, one of the incomplete (?) operations has, after a period of suppuration, resulted in a cure. The details of these thirty-nine recoveries out of fifty-seven operations are as follows:

	Giant-celled Sarcoma.	Spindle-celled Sarcoma.	Small Round- celled Sar- coma.	Round-celled Sarcoma.	Lympho- sarcoma.	Fibro- sarcoma.	Myxo- sarcoma.	Mixed or Unclassified Sarcoma.	Mixed Tumors.	Total.
At end of 1 year	9	6	6	0	0	5	0	11	2	39
At end of 2 years	9	5	6	0	0	5	0	9	2	36
At end of 3 years	9	5	6	0	0	4	0	7	1	32
At end of 5 years	7	5	3	0	0	2	0	6	0	23
At end of 7 years	3	5	1	0	0	2	0	3	0	14
At end of 10 years	1	4	0	0	0	1	0	2	0	8

More detailed statistics of each variety of sarcoma follow:

Giant-Celled Sarcoma.

Cases, 12.

Deaths, 1, eighteen months after first symptom.

Unknown, 1.

Recoveries, 10.

Well at end of 1 year, 9; 3 years, 9; 5 years, 7; 7 years, 3; 10 years, 1.

Average duration of symptoms from their first appearance to operation, $12\frac{1}{4}$ months; minimum, 4 months; maximum, 24 months.

Spindle-Celled Sarcoma.

Cases, 13.

Deaths, 6. Average duration of life from first symptom till death, $23\frac{2}{3}$ months; minimum, 8 months; maximum, 52 months.

Unknown, 1.

Recoveries, 6.

Well at end of 1 year, 6; 3 years, 5; 5 years, 5; 7 years, 5; ten years, 4.

Average duration of symptoms from their first appearance to operation, 28 months; minimum, 4 months; maximum, 60 months. Out of 7 complete operations, 6 recovered, 6 died.

Small Round-Celled Sarcoma.

Cases, 29.

Deaths, 18. Average duration of life from first symptom till death, 25 months; minimum, 6 months; maximum, 96 months.

Unknown, 4.

With recurrence, nearly dead 32 months after operation, 1.

Recoveries, 6.

Well at end of 1 year, 6; 3 years, 6; 5 years, 3; 7 years, 2.

Average duration of symptoms from their first appearance to operation, $9\frac{1}{2}$ months; minimum, 1 month; maximum, 72 months. Out of 11 complete operations, 5 recovered, 6 died.

Round-Celled Sarcoma.

Cases, 11.

Deaths, 5. Average duration of life from first symptom till death, 22 months; minimum, 12 months; maximum, 37 months.

Unknown, 4.

With recurrence, but alive, 2.

Recoveries, 0. Three only of these operations were judged to be complete.

Lymphosarcoma.

Cases, 10.

Deaths, 4. Average duration of life from first symptom till death, 26 months; minimum, 9 months; maximum (two operations), 52 months.

Unknown, 4.

Alive and well 2 months after operation, 2.

Recoveries, (?) or 0.

Two only of these operations were judged to be complete.

Myxosarcoma.

Cases, 3.

Deaths, 2. Average duration of life from first symptom till death, 49 months; respectively, 38 and 60 months.

Unknown, 1.

Recoveries, 0.

One only of these operations was judged to be complete.

Fibrosarcoma.

Cases, 14.

Deaths, 3. Average duration of life from first symptom till death, 22 months; minimum, 14 months; maximum, uncertain, as history of skin tumors for 21 years.

Unknown, 5.

Well, 2 months after operation, 1.

Recoveries, 5.

Well at end of 1 year, 5; 3 years, 4; 5 years, 3; 7 years, 2; 10 years, 1.

Average duration of symptoms from their first appearance till operation, 25 $\frac{1}{3}$ months; minimum, 3 months; maximum, 60 months. Seven only of these operations were judged to be complete.

Mixed Unclassified Sarcoma.

Cases, 31.

Deaths, 12. Average duration of life from first symptom till death, 16 months; minimum, 4½ months; maximum, 40 months.

Unknown, 7.

With recurrence, but alive, 1.

Recoveries, 11.

Well at end of 1 year, 11; 3 years, 7; 5 years, 6; 7 years, 3; 10 years, 2.

Average duration of symptoms from their first appearance till operation, 13 months; minimum, 3 months; maximum, 60 months. Fifteen only of these operations were judged to be complete.

Mixed Tumors.

Cases, 2.

Deaths, 0.

Recoveries, 2.

Well at end of 25 months, 1; 50 months, 1.

DURATION OF LIFE IN FATAL CASES FROM APPEARANCE OF FIRST SYMPTOM TILL DEATH.

	No.	Average.	Minimum.	Maximum.
Giant-celled sarcoma.....	1	18 months.	.....	.....
Spindle-celled sarcoma.....	6	23¼ months.	8 months.	52 months.
Small round-celled sarcoma.....	18	25 months.	6 months.	96 months.
Round-celled sarcoma.....	5	22 months.	12 months.	37 months.
Lymphosarcoma.....	4	26 months.	9 months.	26 months.
Myxosarcoma.....	2	49 months.	38 months.	60 months.
Fibrosarcoma.....	3	22 months.	14 months.	?
Mixed or unclassified sarcoma.....	12	16 months.	4½ months.	40 months.

While many of the above cases present features of interest, it is not the object of this paper to record individual cases. Of a few organs, however, there have been a sufficient number of cases of sarcoma to warrant the more detailed statements of the results of operation. Of the jaw there are eighteen cases; of the lymphatic glands of the neck, seventeen cases, and of the lower extremity, twelve cases. In this connection, it may be of interest to refer to a successful operation on a patient with a small round-celled sarcoma of the brain, who at the present

time, thirty-eight months after operation, is perfectly well. (*Presbyterian Hospital Reports*, Vol. v.) Also to a successful operation for a small round-celled tumor of the spinal cord, the patient being now, more than four years after operation, perfectly well. (*The Journal*, August 31, 1901.)

Sarcoma of Jaws.—These cases are divided into two classes: (1) where the sarcoma affected the body of one or other jaw, necessitating its partial or complete removal; (2) so-called epulis of sarcomatous nature, where but the alveolar process and gum were affected. Several cases of epulis which showed mainly a fibrous or connective-tissue structure are not included. Out of eighteen operations, it will be noted that there was no death following soon after operation. Two cases have disappeared; but one case, and that a spindle-celled sarcoma, has died of recurrence at the end of four years. As to the ultimate results, at the end of three years twelve cases are perfectly well; eight of these are giant-celled, one spindle-celled, one fibrosarcoma, and two are of the mixed variety, mainly small round and spindle-celled. Eight cases have survived seven years or more, and three cases more than ten years.

I.—INFERIOR MAXILLA. FIVE CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Symptoms.	Excision.	Variety of Sarcoma.	Result.
1	M. E. F.	F.	22	12 months.	$\frac{1}{2}$ inferior maxilla.	Small and spindle-celled.	Well, 15 $\frac{1}{2}$ years later.
2	M. M. F.	F.	21	4 months.	$\frac{1}{2}$ inferior maxilla.	Spindle-celled.	Well, 16 years later.
3	A. W. F.	F.	19	6 months.	$\frac{1}{2}$ inferior maxilla.	Giant-celled.	Well, 8 $\frac{1}{2}$ years later.
4	J. B.	F.	37	2 months.	$\frac{1}{2}$ inferior maxilla.	Fibro-, spindle-, and small-celled.	Well, 4 $\frac{1}{2}$ years later.
5	A. E.	F.	37	9 months.	$\frac{1}{2}$ inferior maxilla.	Giant-celled.	Well, 3 $\frac{1}{2}$ years later.
6	L. K.	F.	24	3 months.	$\frac{1}{2}$ inferior maxilla.	Giant-celled.	Well, 2 $\frac{3}{4}$ years later.

SUPERIOR MAXILLA. FIVE CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Symptoms.	Excision.	Variety of Sarcoma.	Result.
1	B. J.	F.	12	12 months.	Left superior maxilla.	Giant-celled.	Well, 11 years later.
2	B. N.	M.	44	24 months.	Right superior maxilla.	Spindle-celled.	Well, 1 year later.
3	C. H.	M.	34	14 months.	Right superior maxilla.	Giant-celled.	Well, 3 months later.
4	T. N.	M.	45	6 months.	Left superior maxilla.	Spindle-celled.	Death in 4 years.
5	A. S.	F.	18	3 months.	Right superior maxilla.	Giant-, round-, and small-celled.	Unknown.

II.—EPULIS. SEVEN CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Symptoms.	Excision.	Variety of Sarcoma.	Result.
1	E. C.	F.	19	5 months.	On superior maxilla.	Giant-celled.	Well, 8 years later.
2	M. O.	F.	26	36 months.	On inferior maxilla.	Giant-celled.	Well, 6 years later.
3	H. M.	F.	20	12 months.	On inferior maxilla.	Giant-celled.	Well, 5 years later.
4	B. L.	F.	8	4 months.	On inferior maxilla.	Giant-celled.	Well, 5 years later.
5	J. H.	M.	21	7 months.	On superior maxilla.	Fibro-celled.	Well, 4 years later.
6	L. H.	F.	31	6 months.	On superior maxilla.	Giant-celled.	Unknown.
7	L. S.	F.	31	3 months.	On inferior maxilla.	Fibro-celled.	Unknown.

Sarcoma of Lymphatic Glands of Neck.—The cases number seventeen. In eight only has the operation been considered more or less complete. In the other nine the disease was too extensive for removal.

Of the seventeen cases, the results are, Deaths from recurrence, 8; recoveries, 3; unknown, 4; too recent operation, 2.

The after history is known in four only of the supposedly complete operations; three of these are well at eight and one-half, five, and four and one-half years respectively; one died of recurrence fourteen months after operation.

In these seventeen cases, nine were lymphosarcomata, and not one of these is known to have recovered. This observation exactly corresponds to that of other surgeons.

SARCOMA OF NECK. SEVENTEEN CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Duration of Symptoms.	Operation.	Variety of Sarcoma.	Ultimate Result.
1	J. M.	M.	27	1 month.	Extensive.	Small, round.	Well, 8½ years later.
2	M. K.	F.	24	24 months.	Extensive.	Small, round, mixed tumor.	Well, 5 years later.
3	P. R.	M.	26	3 months.	Extensive.	Sarcoma, adenoma, and carcinoma.	Well, 4½ years later.
4	T. B.	M.	26	72 months.	Incomplete.	Small, round.	Death, 11 months later.
5	L. P.	M.	30	32 months.	Incomplete.	Lympho.	Death, 1 month later.
6	A. Z.	M.	40	2 months.	Incomplete.	Round and spindle.	Death, 5 months later.
7	W. H.	M.	24	36 months.	Complete (?).	Lympho.	Death, 14 months later.
8	E. C.	M.	24	8 months.	Incomplete.	Lympho.	17 months after first operation: death, 14 months after second operation.
9	Mrs. C.	F.	57	2 months, secondary to uterus.	Incomplete.	Small, round.	Death, 1 month later.
10	M. H.	F.	44	4 months.	Incomplete.	Unclassified.	Death, 3 months later.
11	E. N.	F.	50	3 months.	Incomplete.	Lympho.	Death, 4 months later.
12	A. S.	F.	47	36 months.	Extensive.	Unclassified.	Unknown.
13	M. A.	F.	30	6 months.	Incomplete.	Lympho.	Unknown.
14	L. B.	F.	36	1 month.	Extensive.	Lympho.	Unknown.
15	E. S.	F.	44	12 months.	Complete.	Lympho.	Unknown.
16	A. A.	F.	22	24 months.	Complete.	Lympho.	Too recent date.
17	H. S.	M.	54	18 months.	Incomplete.	Lympho.	Too recent date.

Sarcoma of the Lower Extremity.—The subject of the sarcomata of the long bones has for years received considerable attention from surgeons, and especially is this true of the bones of the lower extremity. In this connection two questions are of importance. First, as to the choice in certain cases between resection and amputation. Mikulicz and a few other surgeons of reputation are in favor, in certain properly selected cases, of resection in preference to amputation. The majority of surgeons recommend amputation in all cases. There can be no doubt, however, but that the results of a few resections have been most satisfactory. I am not inclined to favor this procedure; but perhaps in certain encapsulated giant-celled sarcomata it may be an appropriate operation. The existence of encapsulation is, however, a very difficult point to determine, so difficult to my mind is it that I have never yet seen a case whose interests I felt could be best served by a resection in preference to an amputation.

The second question is whether in every case it is necessary to remove the limb at the joint next above the disease, or whether it is not often sufficient to simply amputate well above the seat of the sarcoma. For instance, in a sarcoma of the lower end of the femur, is the operation of choice disarticulation at the hip-joint, or amputation at the upper part of the thigh? We need more light on this subject; but I am inclined to believe that the lesser operation is often preferable, and equally as safe.

It will be seen that there have been 11 amputations of the thigh, for sarcoma of the femur, or head of the tibia or fibula. There have been no deaths due to the operation. One patient has disappeared. Of the 10 other patients, 5 have died of metastases or recurrences,—2 at the end of 12 months; 1 at the end of 8 months; 1 at the end of 6 months; 1 at the end of 3 months. There are alive and well, 4 years after operation, 5 cases; 5 years after operation, 4 cases; 10 years after operation, 2 cases. Of the 5 cases who have survived 4 years or more, in 2 the sarcoma was spindle celled, in 1 giant and round celled, in 1 fibro and spindle celled, and in 1 giant and spindle celled.

It will be seen that of the 7 cases of sarcoma of the femur, 4 have died of recurrence, 3 are well from 4½ to 12 years after operation.

SARCOMA OF THIGH. SEVEN CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Duration of Symptoms.	Operation.	Variety of Sarcoma.	Ultimate Result.
1	P. O.	M.	34	4 months.	Hip-joint disarticulation.	Spindle.	Well, 12 years later.
2	H. W.	F.	35	6 months.	Hip-joint disarticulation.	Giant, spindle, and round.	Well, 5½ years later.
3	W. K.	M.	23	9 months.	Hip-joint disarticulation.	Fibro and spindle.	Well, 4½ years later.
4	G. F.	M.	32	12 months.	Hip-joint disarticulation.	Small, round.	Death, 1 year later.
5	W. B.	M.	22	8 years.	Hip-joint disarticulation.	Small, round.	Death, 8 months later.
6	M. A.	M.	15	4 months.	Hip-joint disarticulation.	Spindle and giant.	Death, 1 year later.
7	A. T.	F.	27	12 months.	Amputation below trochanter.	Fibro and spindle.	Death, 3 months later.

SARCOMA OF LEG. FOUR CASES. OPERATIVE MORTALITY, 0.

No.	Name.	Sex.	Age.	Duration of Symptoms.	Operation.	Variety of Sarcoma.	Ultimate Result.
1	J. C.	M.	35	Injury, 22 months.	Middle thigh amputation.	Spindle.	Well, 13 years after.
2	F. A.	M.	25	15 months.	Middle thigh amputation.	Giant and spindle.	Well, 5½ years after.
3	M. K.	F.	18	4 months.	Below trochanter.	Spindle.	Death, 6 months after.
4	D. H.	F.	30	Injury, 22 months.	Middle thigh.	Giant.	Unknown.

THE COMBINED TRANSVERSE AND LONGITUDINAL INCISION IN LAPAROTOMY.¹

BY LEWIS A. STIMSON, M.D.,

OF NEW YORK,

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At a meeting of the New York Surgical Society in December, 1900, I presented several patients whose abdomens I had opened by a combined transverse and longitudinal incision, that procedure having been selected with a view to the avoidance of a subsequent hernial protrusion at the scar. (See *ANNALS OF SURGERY*, April, 1901.)

A year later, December, 1901, I prepared a short paper upon the subject, which was published in the *Medical Record*, June, 1902, the delay in publication having been caused by circumstances not under my control.

My purpose in bringing the subject to notice again is to acknowledge, what, of course, I was not aware of at the time of presentation and publication, that I had been anticipated in both performance and publication, to trace the origin and development of the method, and again to ask attention to what I conceive to be the great advantages of the method, and to report the results of my subsequent experience with it.

The literature bearing upon the origin of the plan is as follows: The Report of the International Congress on Gynecology and Obstetrics at Geneva, August, 1896, and an abstract thereof in *La Presse Médicale*, 1896, p. 480; a short paper by Küstner in the *Monatschrift für Geburtshilfe und Gynäkologie*, September, 1896, p. 197, abstracted in the *Centralblatt für Chirurgie*, 1897, p. 231, and in the *Centralblatt für Gynäkologie*, 1897, p. 271; a long paper by Pfannenstiel in Volkmann's *Sammlung klin. Vorträge, Gynäkologie*, No. 97, N. F., p. 268, issued in February, 1900; a thesis, "De l'incision cruciale dans

¹ Read before the New York Surgical Society, March 23, 1904.

la laparotomie," by Naudet, Paris, 1900, containing a report of Professor Hartmann's cases; and my report already mentioned, December, 1900. Other papers treating of the subject and reporting cases have been published by Dartigues, *Presse Médicale*, October, 1899, p. 202; Cumston, *Annals of Gynäkologie*, October, 1901, and Menge, *Centralblatt für Chirurgie*, August, 1903, p. 954.

Two ideas, widely separated in the objects sought, but clearly connected by suggestion, appear as the originating impulse in these papers.

The first was that of making a transverse incision through the skin alone at or within the margin of the pubic hair, and following it with the usual longitudinal incision along the linea alba, for the sole purpose of obtaining an inconspicuous scar. Its first public mention was by Küstner at the Geneva Congress, and it was embodied in his paper in the *Monatschrift für Geburtshilfe* published the following month. In this paper he states that he had employed the method eight times in the preceding three weeks, and he supports his recommendation of its use by the argument that many patients will accept a vaginal operation, while they refuse one through the anterior abdominal wall because of the evident scar left by it. A day or two later, in the Congress, Rapin, of Geneva, referred to Küstner's statement, and said that he himself had employed the same method in seven cases during the preceding two years with the same object, namely, to diminish the scar. Dartigues, 1899, reports Segond's use of the method, and Cumston reports a personal experience with it in about forty-five cases. All speak only of the minimizing of the cutaneous scar as the object, and all deem it applicable only to operations that can be accomplished through a small opening in the abdominal wall.

The second idea is that of obtaining a firmer reunion of the divided wall, of preventing hernia in the scar line, by carrying the transverse incision not merely through the skin, but also through the aponeurosis of the external oblique and the anterior layer of that of the internal oblique, the "sheath

of the rectus," and confining the longitudinal incision to the separation of the recti and the division of the peritoneum.

Pfannenstiel was the first to operate in this way and to publish his results. It is singular that his long and elaborate paper, with so important an idea as the better prevention of hernia for a text, a subject so frequently discussed, should not have been mentioned in the periodical reviews, while Küstner's paper, covering only a page and dealing only with a cosmetic object, should have been abstracted in two of them.

Pfannenstiel reported that he had employed the method for two years, in fifty-one cases. His technique is essentially that employed by later users of the method, and the only point at which an advance has been made is in the greater extension given to its range of applicability. He would restrict it mainly to operations of relatively slight extent upon the uterine appendages, although declaring that hysterectomy is possible. He states that the idea was suggested to him by Küstner's article, 1896.

In like manner the idea had been suggested to me by the reprint of Küstner's article in the *Centralblatt für Chirurgie* in 1897; and to carry the transverse incision through the aponeurosis and sheath—thus applying to the operation the principle of McBurney's intramuscular operation upon the appendix and securing the great advantages with which we are all so familiar—seemed so natural a suggestion that, as stated in my article in the *Record*, I thought it must have occurred to and perhaps had been put into practice by others. The suggestion remained dormant until my interest was aroused by observation of two or three cases of postoperative ventral hernia in the autumn and winter of 1899, and the first application of it was made in a case of pyosalpinx admitted to the Hudson Street Hospital, March 12, 1900. Pfannenstiel's publication was made the preceding month, but did not come to my knowledge until two years later. It establishes his priority of execution and publication, and I can lay claim only to independent conception.

Another surgeon, Professor Hartmann, of Paris, conceived the method independently, and first made use of it in

May, 1900. He made no publication of it under his own name, but followed a common French custom, and gave it to the public through the graduating thesis of one of his students, Naudet. This thesis bears only the date "1900," but as one of the five cases therein reported underwent operation on November 15, 1900, it is not probable that it was published before December.

It is not categorically stated in the thesis that Professor Hartmann's conception of the method was original with him, but as Pfannenstiel's paper is freely quoted from, and as there is no essential or even important difference in the technique, no other reason appears for associating his name so closely with it.

To summarize it: Rapin was the first to substitute a transverse incision through the skin for a cosmetic purpose; Küstner conceived the same plan independently about two years later, and was the first to publish it. Pfannenstiel was the first to plan, execute, and publish the method of a transverse incision through the aponeuroses for the purpose of maintaining the solidity of the abdominal wall and preventing postoperative hernia.

But a matter of much more general interest is the availability, the efficiency, of the operation. Are its results such as are claimed for it? does it permit an adequate exposure of the abdominal cavity? has it disadvantages which offset its advantages?

These questions can be answered only by the test of experience in many hands; and evidence is accumulating that the test is rapidly making, if not already made. My own use of it has been continuous in two hospitals, and of late exclusive whenever there has been occasion to open the lower segment of the abdomen widely, in the male as well as in the female. Three of my colleagues at the New York Hospital have also used it freely, but only, I believe, in operations upon the appendages. A few have used it with increasing frequency and satisfaction in other hospitals in this city. Dr. Charles G. Cumston, of Boston, wrote me last September that he had employed it in 247 cases, and that it was used by others in that city; and

I have been told that it is to be frequently seen in some of the German clinics.

Menge (*Zentralblatt für Chirurgie*, 1903, p. 954) reports thirty-two cases of its use in operations upon the uterus and its appendages, and thinks it will greatly restrict the use of colpotomy and median abdominal section. Among its advantages he counts a greater protection of the intestines from exposure and easier access to the præuterine space; and while he thinks Douglas's pouch is not so easily reached, yet he found no difficulty in doing all therein that needed to be done. Apparently he had not employed it in any case of uterine carcinoma or large solid tumor. And although all his wounds healed *per primam*, he thinks the chance of infection and supuration of the parietal wound may be greater than with the median incision.

My personal experience covers its use in at least 150 cases. The great majority were operations upon the uterine appendages, but the list includes several total and supravaginal hysterectomies for fibroid and carcinoma, several ectopic gestations, two cases of gunshot wound of the intestines, both recovering, resection of the intestine, intestinal obstruction, and a few explorations. Of the results of that experience, I beg to speak briefly.

The first step—the opening of the abdomen—requires a little more time than does the median incision, and so too may its closing. But the total excess is small, not more than five minutes. The line of the incision is a shallow curve, concavity upward, and crosses the median line three or four centimetres above the symphysis pubis. The sides extend towards the anterior superior spines, but stop well short of them, the extent depending upon the purpose of the operation and the amount of fat in the abdominal wall. Sometimes a total length of three inches is sufficient. When the incision needs to be lengthened, either at the beginning or in the course of the operation, I make the prolongation more upward than outward.

The aponeurosis of the external oblique, having been exposed throughout, is divided in the line of the incision, as is

also that of the internal oblique or "sheath of the rectus." The knife may be used for this, or, very conveniently after the division of the central portion, the scissors. Occasionally, the muscular fibres of the internal oblique extend further inward than usual, overlying the outer portion of the rectus, and are involved in the cut. Then lifting the central portion of the aponeurotic flap with forceps, it is freed upward with the knife along the linea alba and the outer border of the pyramidales until those muscles have been passed, then rapidly freed on each side from the rectus by stripping with the fingers, and the separation along the median line is completed with the knife, taking care to keep the edge close to the surface of the muscle so as not to thin or possibly button-hole the flap. One or two arteries running from the rectus to the aponeurosis need to be secured; except for these, the separation of the flap is bloodless. I generally plan not to carry the incision of the aponeurosis beyond the outer border of the rectus, and, if more room is needed, to extend it along that border upward rather than transversely.

The flap is then drawn sharply upward, and the abdomen opened in the median line in the usual manner. It is easy to extend this separation of the flap and the median opening to the umbilicus, but, of course, that cannot be passed.

I have thought that, length for length, the median incision thus relieved from the lateral resistance of the aponeurosis gives a wider opening and freer access to the abdomen than when made in the usual manner.

In two or three of my earlier cases, where more room seemed needed, I split the flap in the median line and prolonged the incision upward. This tardy abandonment of the plan and reversion to the old method was accomplished with ease; and the only cost to the patient—the superfluous transverse incision and the stripping-up of the flap—led to no recognizable ill results.

Occasionally, when the umbilicus was unusually high and much room would surely be needed, I have made the transverse incision about an inch higher than above described, and have

secured some additional space by a short median cut in the aponeurosis downward towards the symphysis.

The operation having been completed, the wound is closed by suture of the peritoneum and of the aponeurotic layer posterior to the recti wherever it can be readily identified and secured; and if the recti tend to fall apart, two or three points of suture may be placed in them. The aponeurotic flap is secured in place by chromic catgut sutures for an inch or two on each side of the median line, and the remainder by plain catgut, interrupted or continuous. Sometimes I unite the two layers separately, and sometimes (especially if anxious to save time) include them in the same sutures. It seems to be a matter of indifference whether or not their exact reunion is effected, since the pull of their muscles has little or no tendency to separate the sides of the incision. The skin is closed as usual.

I have generally drained the space beneath the aponeurotic flap for a day or two with rubber-tissue strips introduced on either side.

When drainage of the abdominal cavity was needed, and was not provided for through the vagina, I have drained at the centre of the incision; and, although in several cases such a drain has been long maintained, I have seen no hernial protrusion result. I anticipated at first that infection and suppuration beneath the flap would frequently result in cases in which the operation was done because of suppurative conditions, but such a result has been very infrequent, and when such suppuration has ensued it has been limited to the neighborhood of the median line.

The scar has been inconspicuous and freely movable in all except one case, and has shown very little of that broadening which is so common after median incision. In that case, a very fat woman, the scar retracted deeply.

In no case has any weakness of the abdominal wall, any tendency to hernial protrusion, manifested itself; and a consideration of the anatomical conditions and of the factors productive of such weakness seems to justify the confident antici-

pation of its absence. The scar of the longitudinal portion of the incision is not subjected to the pull of the lateral muscles, which is so important a factor in widening that left by a median incision through the aponeurosis, and the action of intestinal distention is efficiently met by the aponeurotic sheet unbroken except where it is guarded by underlying muscle.

In a case in which the operation was repeated after a few months, I found the aponeurotic flap not only solidly reunited along the incision, but also strongly attached to the tissue between the recti, and the latter was noticeably thicker than at first.

The cosmetic element I leave without comment. It seems unimportant, and yet several have mentioned it as sufficient to win the consent of a patient to the operation.

In conclusion, I feel justified in recommending the method as one that is easy of execution, ample for any abdominal work that can be done through a median incision below the umbilicus, easy of repair, and affording apparently complete protection against postoperative ventral hernia.

PEPTIC ULCER OF THE JEJUNUM.

BY A. W. MAYO ROBSON, F.R.C.S.,

OF LONDON.

THE subject of peptic ulcer is an extremely interesting one that has given rise to much speculation and to many theories.

In the stomach it is extremely common, in the duodenum probably much more frequent than hitherto supposed, but in the jejunum it is generally acknowledged to be very rarely found; in fact, it is only four years since Braun first described the formation of peptic ulcer in the jejunum of man, and, although the subject has received some attention in Germany,—Braun, Hahn, Kausch, Körte, Kocher, and others having described cases,—this is I believe the first case described in English literature.

In a paper describing a peptic jejunal ulcer following on gastro-enterostomy in a dog, Dr. S. H. Watts has collected and tabulated fourteen cases. I have heard of another which has not yet been published, and my own would make the sixteenth case; but as all of these cases were perforating ulcers, it almost goes without saying that there must be many more that have existed unrecognized, and probably many others that have caused death by abscess and in many other ways, in which the adhesions and other complications have so obscured the parts that even an autopsy has failed to elucidate the true nature of the disease.

The true cause of peptic ulcer, whether gastric, duodenal, or jejunal, is probably a mild form of sepsis leading to gastritis and excess of free HCl in the gastric juice, though traumatism, either by coarse food or through external injury and interference with the circulation in the bowel, has been

ANALYSIS OF REPORTED CASES.

Reference.	Operation, Anterior or Posterior.	Gastric Acidity.	Operation for	Number of Cases.	Number of Ulcers.	Time after Operation.	Result.
Braun	Posterior.	Normal.	Dilated stomach.	1	1	1 year.	Perforation; peritonitis; death.
Hahn.....	All anterior.	All cases. +	Benign stenosis of pylorus.	3	....	....	1st case, perforation and death. 2d and 3d cases, abscess; operation; cure.
Kausch....	All anterior.	2 cases. + 1 case normal.	1st and 2d, pyloric stenosis. 3d, ulcer of stomach.	3	1st and 2d cases, 1 each. 3d case, ulcer recurred.	1st case, 4 months. 2d and 3d cases, ?	1st and 2d cases, perforation; abscess; operation; cure. 3d case, recurrence of ulcer; jejunostomy; death.
Körte	Anterior.	+	Gastric ulcer.	1	1	3 years.	Perforation; peritonitis; death.
Steinthal...	Posterior.	+	Pyloric stenosis.	1	4	10 days.	Perforation; death.
Neumann..	Anterior.	+	Functional. Pyloric stenosis.	1	1	3 to 4 months.	Perforation; abscess; operation; cure.
Köcher	Y of Roux,	—	Gastric ulcer.	1	1	12 months.	Perforation; abscess; operation; cure.
Heidenhain.	Anterior.	Normal.	Pyloric stenosis with ulcer.	1	1	3 to 4 months.	Perforation; adhesions; operation; cure.
Goepel.....	Anterior.	Both. +	Pyloric stenosis. Gastric dilatation.	2	1 each.	4 months. 13 months.	1st case, perforation; death. 2d case, perforation; suture; cure.
Mayo Rob- son, May 5, 1903..	Anterior.	+	Hæmatemesis due to gastric ulcer.	1	?	3 years and 4 months.	Perforation; adhesions; enterectomy; Roux's operation; recovery.
Quenu, June, 1901.....	Anterior.	+	Stenosis of pylorus.	1	?	4 years.	Ulceration; adhesions; enterectomy; Roux's operation; cure.

PEPTIC ULCER OF THE JEJUNUM.

assigned as a cause, but without what seems to me adequate reasons.

Peptic ulcer is distinctly one of the sequelæ to be reckoned with after gastro-enterostomy, though it seems much more likely to occur after the anterior than the posterior operation.

It is curious that, so far as we know, it does not occur after pyloroplasty; but whether the operation of Finney, which makes a much more extensive opening, will be followed by peptic duodenal ulcer, time alone will prove.

As regards the frequency of peptic jejunal ulcers, out of 136 posterior gastro-enterostomies which I have personally performed I have not had one example, nor has one occurred among 100 posterior gastro-enterostomies operated on by a colleague.

My case occurred after an anterior gastro-enterostomy, one out of thirty that I have performed, and Kausch reported two out of 160 gastro-enterostomies performed in Professor Mikulicz's clinic, both being after anterior gastro-enterostomies.

Of the cases in the table, the anterior operation had been done in eleven, the posterior in two, and the Y operation of Roux in one; but whereas, in the two cases of peptic ulcer occurring after the posterior operation, perforation was followed by general peritonitis, in the eleven anterior operations the peritonitis was limited in eight and diffuse only in three.

The symptoms in my case were evidently chiefly referable to the perigastritis and the extensive adhesions, and, although there was intense and agonizing pain at times, it seemed to bear no relation to food.

Vomiting did not occur, nor was the loss of flesh very marked, but hæmorrhage was a distinct feature, and the presence of a well-marked tumor at the site of perforation is to be noted.

Treatment.—Though well recognized, I think it has not been sufficiently grasped that the essential cause of peptic ulcers is of a septic nature, and in many cases the source of the trouble is oral; hence, probably the greater frequency of

gastric ulcer among the poorer classes. The sequence of events being septic gastritis, hyperchlorhydria, and ulceration.

In the cases of gastric ulcer that have failed to yield to medical treatment and in which gastro-enterostomy has been performed, I fear that we have not properly grasped the fact that the operation is, though an important one, still only an incident in the treatment, which ought to be continued on general lines for some time longer or until good health is again established. Greater attention to oral asepsis and to the gastric condition of hyperchlorhydria subsequent to operation is advisable, and in this way the very serious complication of peptic ulcer in the jejunum and relapses in gastric ulcer might be prevented.

In all the cases reported, perforation, associated with acute, subacute, or chronic symptoms has occurred, as will be seen by referring to the tabulated list; hence there can be no question as to the desirability, nay, as to the absolute necessity, of operation, which ought not to be delayed too long. When the abdomen is opened, the treatment will depend on the condition found.

If perforation has occurred into the general peritoneal cavity the condition will be one of the utmost peril, and only capable of relief by immediate cleansing of the peritoneum and closure of the opening, or by excision of the ulcer with subsequent suture.

Though peptic ulcer of the jejunum is frequent after posterior gastro-enterostomy, only two cases having been recorded, when it does occur it is more likely to be acute and not to lead to adhesions.

If, as in the greater number of cases, adhesions have formed, the condition will be less acute, although very distressing, from the associated pain due to perigastritis and adhesions. It will be necessary to detach adhesions and to repair the perforation, but probably in the greater number of cases an excision of the portion of intestine involved and the performance of a Roux's operation will give the best results.

CASE.—*Peptic Ulcer, occurring in Jejunum Three Years and Four Months after Gastro-enterostomy, treated by Enterectomy and Roux's Operation; Recovery.*

Mr. C., aged forty-four years, was sent to me by Dr. Peter MacGregor, of Huddersfield, on January 2, 1900, with the history that he had had pain after food, together with other symptoms of gastric ulcer, for four years, though his first attack of vomiting blood occurred in May of the previous year. The bleeding was rather profuse, but under medical treatment and rest he recovered and was able to resume his occupation. A week before he was sent, there had been a recurrence of the hæmorrhage, which was repeated three days later.

On his arrival at the surgical home he was in a state of collapse, with a barely perceptible pulse. There was well-marked dilatation of the stomach, with tenderness over the pylorus. The history of the pain occurring one and a half hours after food, together with the site of the tenderness and the presence of a large amount of blood in the motions, left no doubt but that the ulcer was at or near the pylorus. As the bleeding had recurred twice in the week, and was persisting and passing into the bowel, operation was decided on. This was done on January 4, 1900. As the patient was in such a feeble condition, every precaution was taken to guard against shock, and it was decided only to perform gastro-enterostomy, as it was quite clear that he would not stand any prolonged search for the bleeding point. An anterior gastro-enterostomy was done, a decalcified bone bobbin being used to make the anastomosis, the opening being made close to the lower border of the stomach. The pylorus and first portion of the duodenum were very much thickened, evidently the result of ulceration. His temperature and pulse were never above normal, and he made an uninterrupted recovery. He was fed by nutrient enemata for the first few days, only taking sips of water by the mouth; but at the end of that time he was allowed to take milk and soda water, and then gradually to have stronger food. He was up at the end of the third week and returned home within the month.

The patient remained well for two years, and had neither pain after food nor vomiting. He gained his normal weight and was able to do his work. After this he began to have pain at the epigastrium. The pain seemed to bear no relation to food and

was unaccompanied by vomiting. There was marked tenderness at the epigastrium, especially on the left of the middle line. At times the pain was so acute as to cause him to roll on the floor and to perspire profusely. At first the attacks were not very frequent, only coming on at intervals of a month or two, but recently they had been more frequent, almost daily, and during the week before I saw him dark blood had been noticed in the motions on several occasions.

He was sent to me by Dr. James Hall, on May 5, 1903, when a well-marked tumor was found occupying the epigastrium and decidedly tender to pressure, but there was no vomiting and no sign of stomach dilatation could be discovered. Tarry matter was seen in the motions.

The diagnosis of thickening around a chronic ulcer and perigastritis was made and an exploratory operation advised. The abdomen was opened by an incision just to the right of the middle line, and the stomach was found adherent to the anterior abdominal wall, one inch to the left of the old scar. On separating the adhesions it was found that ulceration had occurred at the point of junction between the bowel and the stomach, and that it had involved the whole circumference of the jejunum at that point, the ulceration having completely extended through the intestinal wall at the front, but this must have occurred after adhesions, so that there had been no acute symptoms of perforation. Through the opening left when the adhesions had been separated, the finger was passed into the stomach, when it was found that the pylorus had quite closed as a result of the ulceration three years before, so that nothing could have passed through it. On passing the finger into the intestine, extensive ulceration and thickening were discovered. The ulcerated portion of the bowel was completely excised and then separated from the opening in the stomach, the edges of which were pared, the distal end of the jejunal loop was implanted into the old opening in the stomach, the union being effected over a bone bobbin, the proximal end was implanted into the jejunum about four inches lower. This union was also effected over a bone bobbin.

The accompanying drawings show the site of the perforation, the base of the ulcer taken from the anterior abdominal wall, the portion of intestine excised, and the intestinal anastomosis that was adopted.

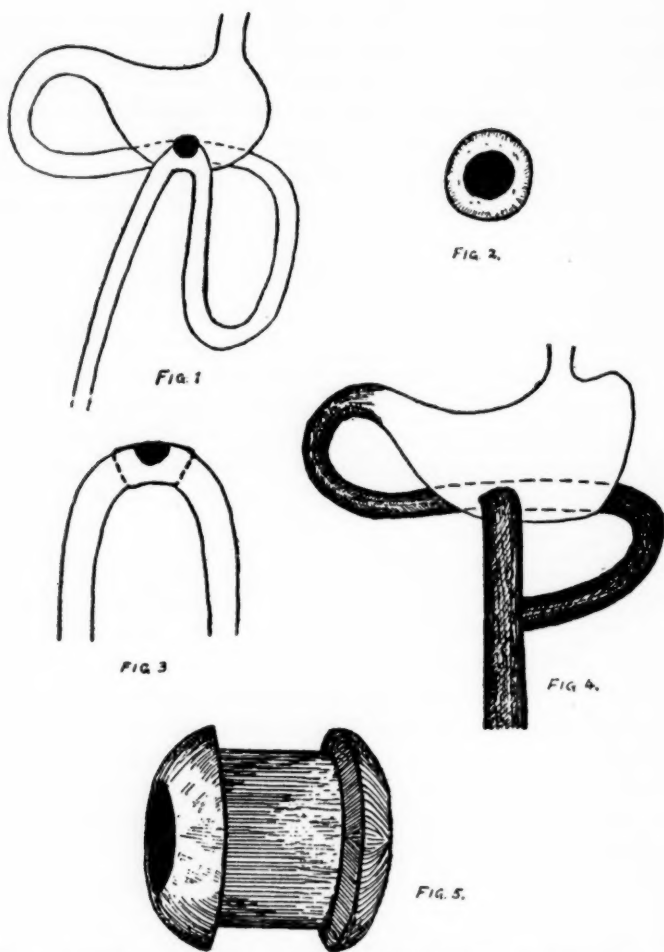


FIG. 1.—Diagram of condition found on separating adhesions, May, 1903, showing perforation.

FIG. 2.—Diagram of portion of ulcer adherent to and detached from anterior abdominal wall.

FIG. 3.—Diagram of portion of intestine excised.

FIG. 4.—Diagram of anastomosis performed after the enterectomy.

FIG. 5.—Size of bobbins used.

The patient made a steady recovery, so that on June 2 the following note was made: "The patient is now quite well and is entirely free from his old pain. The wound has completely healed by first intention." He returned home on June 2.

When seen by his medical man at home on June 4, he was smoking a cigar and expressed himself as very well. Soon afterwards he had a little pain in the region of the gall-bladder, and on June 9 he had a free hæmorrhage, as shown by melæna, after which he made a good recovery and remained well.

A report from Dr. Hall in November, 1903, says that he is in good health.

The subject of peptic ulcer is one of great interest, that may be further elucidated by experimental work and by accurate clinical and pathological investigation, and my excuse for bringing forward only one case must be that the disease is fortunately uncommon, this being, I believe, the first that has been reported in this country.

THE TREATMENT OF POSTOPERATIVE VOMIT- ING BY GASTRIC LAVAGE.¹

BY CHARLES S. WHITE, M.D.,

OF WASHINGTON, D. C.,

House Surgeon in the Emergency Hospital; Instructor in Physiology in the Columbian
Medical School.

It is not an exaggeration to say that persistent post-operative vomiting is one of the most dangerous complications with which the surgeon and patient have to contend, yet this is a subject which has received scant notice at the hands of authors. This can be partially understood when we recollect that it has been only during very recent years that emesis after anæsthesia has been accounted for by strictly scientific and accurate methods. With many of us, vomiting associates itself in our minds with a group of such drugs as bismuth, oxalate of cerium, cocaine, etc., almost *ad infinitum*. The empirical method serves us well when the etiology of the condition is obscure, but with a well-defined cause the elimination or modification of that cause is the only rational and regular method of treatment, any other system of medicine should be classed as homœopathic or something just as bad. I shall show that the etiology of postoperative vomiting is due directly to the anæsthetic, absorbed and discharged into the stomach, and that gastric lavage will remove this irritating substance, thereby preventing nausea and vomiting.

The relative importance of this subject will appeal to any one constantly or occasionally in attendance upon surgical cases. Nausea in itself is a most depressing condition, mentally and physically, and, added to this, vomiting, especially after an abdominal operation, we have a condition which surpasses any other, so far as my knowledge goes, in point of dis-

¹ Read before the Clinical Society, Washington, D. C., April 11, 1904.

comfort. That it has a serious aspect is illustrated by two cases, briefly cited, which have come under my observation.

The first was a female, white, who had had both appendages removed. Vomiting began after the operation and continued, with few remissions, until four days later, at which time she died. The usual remedies were used and salt solution and olive oil subcutaneously with temporary benefit.

The second case was curettage after abortion. She was not considered an ill woman before this time. As she reacted, vomiting began, and continued almost without interruption until her death about six days later.

In both of these cases sepsis could be positively excluded.

While an interne at Columbia Hospital, two cases of ventral hernia occurred suddenly, after an attack of vomiting, and shortly after laparotomy had been performed. The practice at that time, as it is now, was to close abdominal wounds by sutures in tiers, and we shall never know how many buried sutures were broken by vomiting, and I firmly believe that the majority of ventral herniæ occurring in clean wounds are inheritances from postoperative vomiting. During regurgitation, blood-pressure is raised and the heart accelerated, both predisposing causes of secondary hæmorrhage. These are the more serious consequences, but we are witnesses to the fact that those patients who vomit excessively after regaining consciousness, frequently disarrange the dressing, do not remain quiet, require much more attention for the time being, make other patients nervous, and usually refuse a second operation should it become necessary.

The recent contributions of F. B. Turck (*Journal of the American Medical Association*, 1903, xl, pages 1206-16), to our knowledge of physiological surgery, have been so far in advance of any work along this line that I shall not hesitate to quote freely from him. His method was to tie the œsophagus of a dog, then administer the anæsthetic in the usual way. After using ether or chloroform an hour, he could detect the respective anæsthetic in the stomach contents, demonstrating

conclusively that it reached the stomach *via* the circulation, and was excreted by the cells of the gastric mucous membrane. He also dissected off the mucous membrane, distilled it, and invariably recovered ether or chloroform. This is not surprising, though generally unknown, and we have another illustration in morphia. This drug, used hypodermically, will appear in the stomach, and, if used in poisonous amounts, the stomach-tube plays an important part in the treatment.

Turck states that the prolonged use of chloroform or ether acts directly on the vasomotor centre and increases the pressure in the splanchnic areas with a fall of temperature. The toxins of chloroform and ether acting on cells disturb their metabolism and produce toxic bodies, which in turn cause auto-intoxication, associated with hemolytic and agglutinating bodies and precipitants.

There is lessened resistance of blood serum to normally excreted toxins and bacterial toxins, and to the growth of saprophytic and pathological organisms.

"That reflex effects result, such as reflex irritation set up by the excretion of the anæsthetic into the stomach and intestines.

"As the result of atony, there is the formation of toxins in the stomach and intestines through bacterial growth.

"Atony of the stomach and intestines results in accumulation of gases and interference with the circulation.

"There is increased toxicity of the stomach contents in the presence of chloroform and ether."

Summed up briefly, during anæsthesia there is a condition of atony of the stomach walls, together with an exudate of chloroform or ether into the stomach, acting as an irritant, and there is formed in their presence an increased amount of toxic substances.

I have autopsied several cases in which persistent vomiting was a feature, and in these cases found the stomach empty, the mucous membrane having a bluish-black, mottled appearance, and covered by tenacious mucus. The discoloration was due to capillary hæmorrhage.

The multiplicity of methods of treating postoperative vomiting warrants the assumption that no one method is specific, and a great many are useless. There are certain principles which many surgeons have adopted, and consist in having the gastro-intestinal tract empty before operation and keeping it at rest subsequently. To accomplish this no nourishment should be given within ten hours previous to the operation, and the bowels emptied by purgatives and enemata. Following the operation, nourishment or water should not be allowed for at least twelve hours, better twenty-four, and never to permit anything by mouth while nausea exists, as the smallest amount may produce a vomiting attack. During the past five years I have attended between two and three hundred postoperative cases, and cannot recall a single instance in which the vomiting ceased promptly and permanently after the exhibition of any drug, and always felt that the treatment by medication was more or less experimental. Each physician has a different remedy, and, as a rule, each remedy is usually worthless.

The only method which has given uniformly good results in my hands has been lavage of the stomach immediately after the anæsthetic is stopped and before the patient leaves the table.

With the etiology of vomiting known, the *rationale* of this plan is simple and logical, while its practical application is not beyond the resources of a senior student.

The stomach-tube required is one of the usual length, size, and moderately stiff, one eye in the extreme end, the second half an inch from the end, and the third an inch from the end, but opposite the second. No pump or bulb is necessary, and the rubber funnel usually attached should be replaced by one of glass. While the patient is thoroughly under the anæsthetic, a mouth-gag separates the jaws, the head resting upon the occiput. The tube is inserted well back against the pharynx and gently pushed down into the œsophagus until the end enters the stomach, usually indicated by a mark eighteen inches from the end of the tube. This varies but slightly. Occasionally we meet with resistance in the œsophagus (spasm),

and this is best overcome by steady, gentle pressure. Salt solution or sterile water is poured in the funnel, held about two feet above the patient, until a pint and a half or two pints are used, then the funnel is inverted close to a bucket upon the floor at the right of the table, at the same time the patient's head should be rotated strongly towards the right. The fluid usually flows freely, and when it ceases, the process should be repeated once or twice or until the fluid returns clear. In removing the tube from the mouth it should be pinched tightly until it is withdrawn, so the fluid it may contain does not flow back into the mouth. The washings usually contain considerable mucus and is frequently stained yellowish green, presumably by bile.

In no case have I failed to introduce the tube, and in not a single instance has a complication arisen during or after the lavage. This method has not abolished postoperative vomiting by any means, but it has lessened it to a very great extent. In a series of twenty consecutive cases, both male and female, ether used principally and of which sixteen were capital operations, I found 60 per cent. did not vomit. In 100 consecutive cases of ether anæsthesia without lavage, taken from records of Columbia Hospital, I found only 30 per cent. did not vomit. Several of my cases which did vomit are worthy of more than passing notice:

CASE I.—Vomited one ounce shortly after operation. There was no further vomiting or nausea.

CASE V.—A physician; appendicitis; before operation often had attacks of vomiting, keeping him in bed one or two days. He had such an attack after the operation. On the third day a dose of calomel caused vomiting.

CASE XIII.—A nurse; ovaritis; appendicitis; nauseated forty-eight hours previous to operation; did not vomit until eight and one-half hours after operation, and then at the time she was given nourishment.

CASE XVI.—Strangulated hernia; fæcal vomiting before operation; when stomach was washed out, a large quantity of dark fluid, with strong fæcal odor, was obtained. Vomited twice after operation.

Of the cases which did not vomit, three were taken to the operating room from the street, without previous preparation, and two of these patients had eaten a hearty meal a few hours previously.

Dr. E. C. Prentiss has kindly analyzed the fluid from the stomach in two cases:

CASE IV.—Quantity, one pint; reaction, neutral; odor, strongly of ether; sp. gr., 1000; sediment, very little, light, white, and flocculent. Free hydrochloric acid absent. Total acidity, zero. Albumen, none; peptone, none; dextrose, none; sugar, none. Microscopically, sediment consists of fat drops, squamous epithelium, and mucus.

CASE IX.—Quantity, one pint; reaction, acid; odor, ethereal; sp. gr., 1000; color, greenish; sediment, rather heavy, green; free hydrochloric acid, 3.3° ; total acidity, 3.3° ; dextrose, none; sugar, none; albumen, none; peptone, none; bile, trace.

It is essential that the patient should be well under the anaesthetic at the time the tube is inserted. If partial reaction has occurred, there may be some difficulty in passing the tube, as the patient makes efforts to regurgitate and clamps the tube between the teeth. Should the fluid not return at once, the tube may be withdrawn an inch or two and again replaced, and slight pressure made over the epigastrium. If there is then no return, remove the tube, flush it out, see that water flows through the tube, and introduce it again. It is never necessary to oil the tube, and grease injures the rubber. Should the tube become soft and pliable, which will probably occur in four to six months, it is to be discarded; therefore care must be exercised to purchase a fairly stiff one, of good quality red rubber.

We have been using gastric lavage at the Emergency Hospital since September, 1903, and, instead of becoming sceptical of its efficiency, our confidence has increased as we become familiar with its workings. While I have kept accurate data of only the first twenty cases, the subsequent ones have been just as satisfactory.

There are three conditions in which this prophylactic treatment is indicated:

1. In cases where there has been insufficient time to prepare the patient. Such patients often have their stomach distended with food.
2. In cases where the anæsthetic lasts an hour or longer. Operations of short duration are usually not followed by vomiting.
3. In cases where the patient previous to operation has suffered with attacks of nausea and vomiting or chronic gastritis.

It is contraindicated in operations upon the stomach and in very young children.

In those cases in which vomiting occurs in spite of lavage, absolute rest of the stomach brings the best results. Keeping the patient quiet by very small doses of morphia or heroin hypodermically, and withholding food and water twenty-four or even forty-eight hours, usually suffices. The intense thirst can be relieved by enemata of salt solution and nutrition maintained by rectal alimentation, but this is not required except in extreme cases. If the vomiting does not subside with such measures wash out the stomach with boric-acid solution. This is the most satisfactory method, and usually is sufficient to cure the most obstinate case.

PRIMARY SPASM AND HYPERTROPHY OF THE PYLORIC SPHINCTER, AND RESULTANT ENORMOUS DILATATION OF THE STOMACH.

RELIEF BY PYLOROPLASTY AND GASTROPLICATION.

BY MICHAEL A. REBERT, M.D.,

OF YORK, PA.

B. M., domestic, aged eighteen years, was brought to me by her mistress with a history of gastric disturbance of two years' standing, gradually increasing in severity until vomiting occurred after ingestion of any and all kinds of nourishment. No hæmorrhage, nor local or general pain. Normal weight, 140 pounds; at time of examination, eighty pounds. Bowels obstinately constipated, the only fæcal matter passed is a few hard pellets.

A perfect picture of starvation. Nothing abnormal detected by palpation. A stomach-tube passed to the level of the pubes. In the prone position the tube could be readily manipulated through the thin and relaxed abdominal walls, and an ineffectual attempt was made to pass it into the pylorus. The stomach, distended with CO₂, practically filled the entire anterior aspect of the abdomen. A diagnosis of pyloric stenosis, probably due to a cicatrized ulcer, was made; pyloroplasty and gastroplication advised and accepted.

Operation.—Immanuel Hospital, Omaha, Nebraska, January 22, 1896. Median incision between sternal cartilage and umbilicus. Inspection and palpation failed to show any sign of inflammatory thickening or narrowing of the pyloric lumen. Invaginating the pyloric end of the stomach and passing the finger towards the pylorus, a diaphragm obstructing the pylorus was encountered. Under considerable pressure a central opening yielded, and allowed the tip of the finger to pass into the pylorus, giving a sense of powerful muscular constriction.

It was decided to do a pyloroplasty after the method of Heineke. An incision was made into the pylorus on its anterior

aspect, a probe-pointed bistoury passed through the central opening of the pyloric valve, cutting outward. The incisions were prolonged into pylorus and stomach about four centimetres.

In the folds of the pyloric valve was a retracted bundle of muscular fibres about six millimetres in diameter. Close inspection failed to reveal any evidence of former ulceration in the pylorus or part of stomach open to inspection. The pyloroplasty was then completed in the usual manner.

It was the intention to do the gastroplication at the same time, but the low condition of the patient would not permit further operative measures. She made a prompt and uneventful recovery, and under careful diet gained strength and flesh rapidly, vomiting only a few times during her stay in the hospital. At the end of four weeks she returned to domestic service. Soon her old chain of symptoms returned, and she insisted on a second operation, although her weight remained at about 100 pounds.

Gastroplication, Immanuel Hospital, September 26, 1896, in the usual manner, except that, instead of passing the sutures parallel to the greater curvature, they were passed perpendicular, including several sections of the large portion of invaginated stomach wall.

Recovery uneventful. She was able to resume work, and in a short time weighed 130 pounds. She was addicted to dietary indiscretions, and had frequent attacks of vomiting during the following year and a half, but retained flesh and strength. Taking into consideration the enormously dilated stomach and its resulting motor inefficiency, this is scarcely a matter of surprise.

In a letter dated January 18, 1904, she states that her stomach for over five years has performed its functions in a normal and satisfactory manner.

Reviewing the case, the first point of interest is the extreme degree of dilatation of the stomach.

In view of the subsequent history of frequent attacks of vomiting, perhaps largely due to indiscretions in diet, but essentially due to motor inefficiency of the stomach, and in the light of more recent work in this field, gastro-enterostomy being frequently done for the relief of dilatation of the stomach of a degree still remaining in this case after the gastroplication,

it would appear as if it would have been good surgery to have done a gastro-enterostomy to facilitate drainage in addition to the gastroplication, and thereby perhaps shortened the period required for the stomach to regain its motor efficiency.

The second point of interest is the pathology. Primary hypertrophy and spasm of the pyloric sphincter is a rather rare condition, probably due to the obscure motor neurosis,, but important from a diagnostic stand-point, especially in ceases of young adults. Even if the diagnosis is not made until the abdomen has been opened, the operative procedure can be much simplified, and the pyloric obstruction effectually relieved through a small incision into the pyloric end of the stomach, blunt hooks passed through the contracted opening of the valve, and the muscle cut in one, two, or more places; even the mucosa could be sutured and the incision in the stomach closed in the ordinary manner.

CONGENITAL AND INFANTILE OMENTOCELE ON
SAME SIDE, SEPARATED FROM GREATER
OMENTUM AND PERITONEAL
CAVITY.¹

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AND

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IN 1901, when operating on a case of left inguinal hernia, an anatomical diagnosis of "fatty hernia" was given for the reasons to be explained later on. Unfortunately, a complete history of the case has been lost, but the few points of interest in connection with it are briefly these: A swelling in the left inguinal region was first noticed when the patient was three years of age. At the time of the operation he was fifty-four years old. It had grown gradually for about thirty-five years, when it attained the size of an adult head, and remained about that dimension up to the time he consulted me. Occasionally he had symptoms of strangulation, which, however, disappeared in a short time. At intervals he had worn a truss, but for many years had not used one. The swelling was diagnosed by many surgeons here and abroad as hernia, and an operation for the radical cure recommended; but, owing to the total absence of any untoward symptoms at the time an operation was advised, consent was not given.

When the patient was seen for the first time in May, 1901, the mass was irreducible. There were symptoms of strangulation present, such as pain, tenderness, vomiting, and inability to have a bowel movement. These were relieved with little difficulty by elevating the hips and applying ice-bags to the swelling.

The operation was performed several months later under

¹ Read before the Chicago Surgical Society, March 7, 1904.

local cocaine anæsthesia, owing to a valvular lesion of the heart, and an atheromatous condition of the arteries.

To understand the hernial relations better, a few points in the operation will be briefly described. After the aponeurosis of the external oblique was incised and the canal exposed, the mass which extended into the scrotum was lifted out. It was doughy in consistency and irreducible, and together with its sac was easily isolated from the surrounding structures. The sac was then opened, and the greater portion of the large fatty mass, which was not adherent, was easily lifted out, and the smaller portion of the same fatty mass, which was fairly adherent to a small area of the sac, ligated and severed. The interior of the sac was shiny, and its upper proximal end was found to have no communication with the peritoneal cavity. After carefully dissecting the sac up to its abdominal pole, a pouch of peritoneum was dragged with it, although the sac with its contents was isolated and removed without opening the peritoneal cavity. This pouch of peritoneum which was dragged down by the mass, after the latter was removed, was pulled forward like any hernial sac and opened. No adhesions were found, and the surplus peritoneum removed. The edges were brought together with a running catgut suture. The rest of the technique, with the exception of transplanting the cord, was similar to a Bassini operation. The patient's recovery was uneventful.

The fact that the mass including the sac had no connection with the peritoneal cavity,—in other words, was extraperitoneal,—explains the faulty anatomical diagnosis.

The specimen is one of congenital and infantile omentocele, with portions of true and false vaginal processes in evidence. It presents the most dependent part of the great omentum with its cavity unobliterated. The hernial mass is nourished from the vessels of the spermatic cord. The testicle is flattened from pressure. The congenital hernia was not adherent, but the infantile hernia had sustained extensive peritoneal losses.

The occurrence of both congenital and infantile herniæ on the same side in one patient is anatomically possible by non-obliteration of the true processus vaginalis after descent of the testicle, and by the presence of a false processus vaginalis.

The omental nature of each hernia is plainly attributable

to the known, rapid, characteristic growth of the omentum in foetal life, in all the higher vertebrates in general, and in man in particular. With the increasing development of the stomach and transverse colon, after rotation of the alimentary canal, the great omentum undergoes important changes, among which are shortening, increased vascularization, peritoneal concretion, and fatty accumulation. The anatomical probabilities in congenital and infantile hernia, therefore, lead us to believe that the inception of these herniæ is to be sought during the anterotatory or U-loop period of the embryonal gut,—a time when the great omentum enjoys its greatest relative length, its relatively most abundant blood supply, and a special relation to the inguinal region where the abdominal walls afford minimal resistance, and when the gubernaculum is reducing the testicle to the scrotal cavity.

The two herniæ traced cephalad end in a common omental mass. The omentocele resident in the false tunica vaginalis, and smaller than the congenital omentocele, had undergone such extensive peritoneal losses that its removal during the operation was, beyond doubt, a matter of most delicate and difficult dissection. The hernia in the true processus vaginalis had in all these years of its continuance sustained no peritoneal loss; and this fact should elicit the inquiry: Do infantile and congenital omentocele in general deport themselves in this manner?

The omental hernial mass derived its blood supply from the vessels of the spermatic cord, a circumstance which, in view of the complete separation of the omentocele from the intra-abdominal omentum, is significant evidence of the extreme chronicity of the case. Two interesting physiological processes must have occurred simultaneously in this specimen: (a) the gradual loss of nourishment through the omental arteries; (b) the gradual establishment of an entirely new circulation.

The omentocele, as a whole, may be compared to a glove with two imperforate fingers; the two fingers occupied the two vaginal processes of the peritoneum. The part of the

omental mass represented by the body of the two-fingered glove in the simile consisted of the anterior and the posterior lamellæ of the great omentum. The finger-like processes must have entered the peritoneal diverticula at a very early date, and the entire omental mass must have been detached from the parent omentum, prior to the deposition of any considerable quantity of fat.

The hernial mass down to the bifurcation contained the most dependent part of the cavity of the great omentum of foetal life. In other words, the relations and conditions of the omental lamellæ were primitive. This feature will be more fully appreciated when it is remembered that in the great majority of adult instances the cavity of the great omentum becomes obliterated in its subgastric parts. Macroscopically, the hernial mass is clearly omentum, which, as is well understood, differs structurally from all other peritoneal derivatives.

The complete expatriation of the omentocele from the abdominal cavity, with entire separation from the parent great omentum, renders this case, so far as we are informed, quite unique. Reduced to the vernacular of ordinary herniology, the expatriation process must have been one of slow strangulation. As previously stated, it must have begun prior to the deposition of omental fat, for extravagant, indeed, were a speculation attributing to the peritoneum in the vicinity of the internal abdominal ring an ability to pinch off this enormous mass of omentum. Two embryologic principles must be in vogue to harmonize the macroscopic findings in this case with known developmental laws, viz., (1) the preservation of the foetal type of great omentum extra-abdominally built up; (2) the tendency of evaginated or diverticular structures in general to become physiologically or pathologically separated from their anatomical antecedents.

The type of the embryonal great omentum prior to rotation of the alimentary canal will be recalled as a reduplication of the two layers of the posterior mesogaster, making an apron of four layers of peritoneum. The two ventral layers form the anterior lamella of the great omentum, while the two dorsal

ones form its posterior lamella. The two ventral layers fuse early with each other; likewise the two dorsal layers undergo early fusion by concrescence of their epithelial cells. The space between the lamellæ is the cavity of the great omentum, and is usually obliterated in infancy. Assuming an early invasion of the non-obiterated vaginal processes by the most dependent part of the great omentum, is its subsequent development according to its foreordained type more remarkable than a tumor of hair in the stomach, and more incomprehensible than an ectopic gestation?

Strangulation, whether acute or chronic, belongs to the embryological class of expatriated structures governed by known laws, and herein, in extreme cases like the one presented, are we to seek our anatomical latitude and longitude. The inherent tendency of diverticular products is (1) to partake of the nature of the part from which they are derived; (2) to become smaller and smaller. The foramen of Winslow, marking the original evagination route of the cavity of the great omentum, is large in the child, but relatively small, or even entirely obliterated, in the adult. The thyroglossal duct tends to early closure, thus expatriating the thyroid body from its oral antecedent. Closure of the craniopharyngeal canal separates the brain from the pharynx. Obliteration of the proximal end of the processus vaginalis shuts off the tunica vaginalis from the peritoneal cavity. The frontal and maxillary sinuses may be temporarily or permanently shut off from the nose. Stenosis of the Eustachian tube may occur, separating the middle ear from the nasopharynx. Numerous cases might be cited confirmatory of the previous statement, that diverticular cavities possess an inherent tendency to close. The great omentum in our specimen occupied two diverticula, and as an extreme possibility, yet in harmony with a universal law, became expatriated. The principle involved is the same as that underlying evaginated structures in general.

As further clinical evidence, confirmatory of the tendency of evaginations to complete expatriation, two specimens from the private collection of Dr. Joseph Fairhall will be described.

In these the omentocele is completely encapsulated, while the peritoneal sac had developed an imperfect partition. These interesting specimens are described below by the operator:

"The history of them as taken from my note-book is as follows: Specimens 50 and 51 are both from the same patient, result of an operation performed at Lake View Hospital, Danville, Illinois, August 10, 1901, by Drs. W. A. Cochran and Joseph Fairhall. Female, married, multipara, aged thirty-eight, weight about 200 pounds, much adipose tissue. Operation, 'Umbilical Hernia.' Umbilicus being removed, a large lump was found attached posteriorly, examination of which showed it to be a sac or pocket of fat. Specimen No. 50 shows the umbilicus with sac removed, showing the fat. No. 51 is the sac which had contained the escaped intestine; close observation will reveal a septum, which divided the sac into two pockets, each containing a fold of intestine. The operation was a successful one, the patient making a rapid recovery, although the closing of the wound was difficult, owing to the amount of adipose tissue encountered."

The anatomical factors concerned in congenital and infantile hernia, like those concerned in acquired inguinal hernias in general, are so intimately associated embryologically with the descent of the testicle and the development and disappearance of the primitive kidney, that a brief reference to this early period and its mesodermic metamorphoses seems eminently practical.

At an early date in the embryo, the indifferent sexual glands, the Muellerian ducts, and the primitive kidney occupy a position behind the dorsal peritoneum in a mesodermic bed, much like the adult kidney, and its ureter are surrounded by their fatty protective. This fibroperitoneal investment for the trio just named extends from diaphragm to bottom of scrotum. The sexual glands develop testicles or ovaries, according to sex, and these subsequently migrate to scrotum and pelvis respectively; the Muellerian ducts, destined to become uterus, vagina, and oviducts, are held in functional abeyance until puberty; the primitive kidney functionates from the start, ex-

ceeds the other two members of the trio in size, a circumstance directly responsible for a figure of speech, by which the common investing peritoneum is called the *ligament of the primitive kidney*. The testicle is bound to the diaphragm above, to the peritoneum in front and laterally, and to the bottom of the scrotum by this self-same ligament of the primitive kidney. For purposes of convenience of description, this ligament has received the following local names: (a) The part in immediate contact with the testicle is called the *mesorchium*; (b) the part extending from the upper pole of the testicle to the diaphragm is called the *diaphragmatic ligament* of the primitive kidney; (c) the part extending from the lower pole of the testicle to the bottom of the scrotum is called the *inguinal ligament* of the primitive kidney.

Interesting metamorphoses looking to the formation of the inguinal canal and the descent of the testicle are now at hand. The primitive kidney disappears, and with its loss the diaphragmatic ligament becomes atrophic; hence the testicle is no longer bound to the diaphragm; the mesorchial attachments give way; hence the testicle is no longer bound to the deep surface of the peritoneum; muscular fibres develop in the inguinal ligament, completing the gubernaculum, and the testicle awaits its passive migration to the scrotum through gubernacular traction.

The gubernaculum is the inguinal ligament plus unstriped muscular fibres. Superiorly, it divides into two branches, one of which is inserted into the lower pole of the testicle, the other into the deep surface of the peritoneum. Inferiorly, the gubernaculum has three attachments,—(a) one to the abdominal wall, which draws the testicle to the internal ring; (b) a second to the pubic bone, which draws the testicle through the inguinal canal; (c) a third to the bottom of the scrotum, which lands the testicle in the scrotum. The testicular and peritoneal insertions of the gubernacular act quite independently of, and not simultaneously with, each other, for the *processus vaginalis* is preformed for the subsequent accommodation of the testicle. On this point, Bevan aptly says:

"The idea so prevalent among medical men, that the testicle drags down a process of peritoneum in its descent, is an error. I have found in all my cases, even when the testicle is well within the abdomen, a large sac of peritoneum passing through the canal, occupying the space in front of the external ring and passing down towards or into the scrotum. Long before the testicle descends, the vaginal process of peritoneum has preceded it, lying in front of the gubernaculum testis, and reaching into the scrotum." (Section on Surgery and Anatomy, American Medical Association, 1903.)

Summed up, the normal migratory phenomena of the testicle are as follows: (1) The testicle, a product of the asexual gland, is firmly attached to the peritoneum and diaphragm by the mesorchium and diaphragmatic ligament, respectively; (2) atrophic changes in the primitive mesorchium and diaphragmatic ligament, following disappearance of the primitive kidney, liberate the testicle, and make its subsequent migration, through gubernacular traction, possible; (3) muscular fibres develop in the inguinal ligament, thus completing the gubernaculum, which has both superior and inferior attachments; (4) the peritoneal gubernaculum reduces the processus vaginalis, while long afterwards the testicular gubernaculum reduces the testicle to the scrotum, and thus, by union of testicle and processus vaginalis, the permanent mesorchium and tunica vaginalis testis are formed; (5) that part of the processus vaginalis between the internal ring and the upper pole of the testicle suffers obliteration.

The following departures from normal migration of the testicle may occur: (1) The testicle may remain in its primitive position, firmly bound to diaphragm and peritoneum by the diaphragmatic ligament and the primitive mesorchium, respectively; (2) the testicle may migrate towards the diaphragm, a circumstance due to a reversed gubernaculum, due to development of muscular fibres in the diaphragmatic ligament instead of in the inguinal ligament; (3) migration of the testicle towards the scrotum may become arrested at any point of its course; (4) there may be two vaginal processes,

true and false, reduced by the peritoneal gubernaculum, favoring both congenital and infantile hernia.

There are three varieties of congenital hernia dependent on the type of unobliteration of the true vaginal process: (1) The pouch of peritoneum remains entirely patulous, permitting contact of hernia with the visceral peritoneum of tunica vaginalis testis. (2) The pouch of peritoneum remains patulous down to a point near the upper pole of the testicle, permitting the so-called hernia into the funicular process. (3) The pouch of peritoneum is closed at the internal abdominal ring by a septum, which, forced down into the pouch by a protruding hernia, forms the encysted variety of congenital hernia. (4) Either of the above varieties may be complicated by an infantile hernia, of which latter, as will appear later, there are four varieties.

On the other hand, an infantile hernia is concerned with an unobliterated true processus vaginalis, and also with a false processus vaginalis. Consequently, there are four varieties of infantile hernia, determined by the *particular degree of unobliteration* of the true vaginal process, into relation with which the infantile hernia is brought. These four varieties are as follows:

1. In the first variety, the infantile hernia in the false vaginal process lies behind the true vaginal process, in which obliteration has occurred at the internal abdominal ring only. In this, three layers of peritoneum are between the operator and the hernia, two belonging to the true and one to the false vaginal process.

2. In the second variety, the infantile hernia, in the false vaginal process, lies behind the true vaginal process, in which obliteration has occurred at the internal ring and also at the level of the upper pole of the testicle. In this, three layers of peritoneum intervene between the operator and the hernia,—two belonging to the true and one to the false vaginal process.

3. In the third variety, the infantile hernia in the false vaginal process lies behind the true vaginal process, in which no obliteration has occurred. In this, three layers of peri-

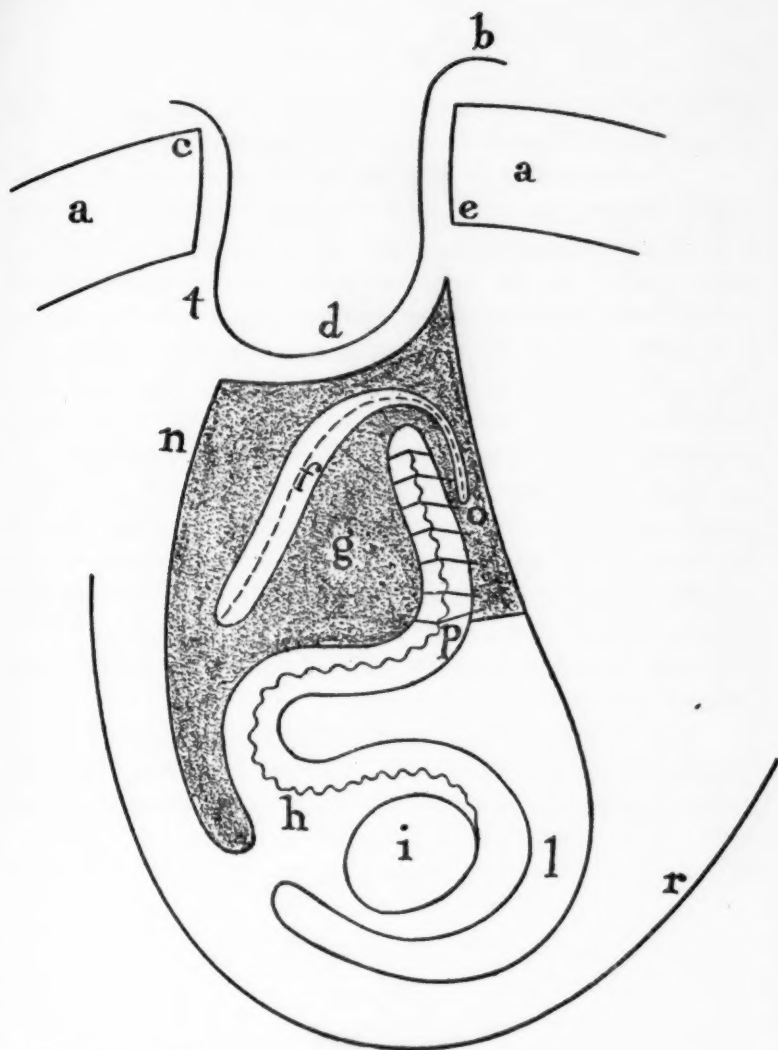


FIG. 1.—*d*. Inguinal canal.

- c*. Internal ring.
- e*. External ring.
- a*. Abdominal wall.
- b*. Parietal peritoneum.
- f*. Unobliterated cavity of omentum.
- n*. Infantile sac situated behind tunica vaginalis below pouch of peritoneum, which it drags with it from above (the testicle lies in the scrotum), and contains omentum. Has no connection with peritoneal cavity.
- g*. Larger part of omentum; looks like bunch of fat.
- l*. Second hernial pouch above the scrotal infantile and funicular hernia.
- o*. Funicular portion of the tunica vaginalis containing part of omentum that receives blood supply from spermatic vessel.
- p*. Branch of spermatic vessel supplying blood to omentum.
- h*. Spermatic cord.
- l*. Tunica vaginalis.
- r*. Scrotum.
- i*. Testicle.

toneum intervene between the operator and the hernia,—two belonging to the true and one to the false vaginal process.

4. In the fourth variety, the infantile hernia in the false vaginal process lies behind the true vaginal process, in which obliteration had occurred at the level of the upper pole of the testicle only. In this, as in the preceding cases, three layers of peritoneum intervene between the operator and the hernia,—two belonging to the true and one to the false vaginal process. This fourth variety of infantile hernia, rendered very complex by an enormous congenital omentocele, is the kind presented, of which the following deserves consideration:

(1) The unobliterated cavity in the lowest part of the great omentum, forming the infantile hernia. (The dotted line (Fig. 1) indicates the passage seen in the specimen.)

(2) The great destruction of epithelium in the congenital hernia is indicated by dots in the drawing.

(3) A very large peritoneal sac containing an infantile hernia freely movable.

(4) A large hernial mass occupying the upper part of the original tunica vaginalis testis, everywhere adherent, even involving the spermatic cord and deriving blood supply therefrom.

UNSUSPECTED LESIONS IN MOVABLE KIDNEYS DISCOVERED DURING NEPHROPEXY.

BY FRANK E. TAYLOR, M.B., F.R.C.S.,

OF LONDON,

Pathologist to Chelsea Hospital for Women.

THE cases here related are, I think, worthy of being placed on record because they show that a movable kidney may be the seat of an entirely unsuspected renal lesion. Moreover, three of them occurred during the writer's tenure of the office of Resident Medical Officer at Chelsea Hospital for Women, London, in the year 1901. During that year the operation of nephropexy or nephrorrhaphy for movable kidney was performed eleven times; and since then there have been nineteen more, making a total of thirty nephropexies in three years. In none of the subsequent cases, however, has an unsuspected renal lesion been discovered in a movable kidney as revealed by the performance of nephropexy. This condition was thus found to exist in three out of thirty cases, or exactly 10 per cent.

CASE I.—*Movable Kidney with unsuspected Renal Calculus; Nephrolithotomy and Nephropexy.*

A. D., a single woman, aged thirty-two years, was admitted into Chelsea Hospital for Women under the care of Dr. A. E. Giles, on December 2, 1901, complaining of dragging pain in the right side, of eight months' duration. The pain was felt both in the front of the abdomen and in the bottom of the back. It had never been felt to shoot into the thigh or labium, and was of a dragging and not of a shooting character. It was, however, exaggerated by exertion and relieved by rest. The pain was also worse at the menstrual periods, which were regular and otherwise normal. The urine had never contained any blood, and on examination was found to be free from albumen and blood. There

was neither difficulty, pain, nor frequency of micturition, nor had any of these symptoms at any time existed.

On abdominal examination the right kidney was found to be freely movable, otherwise *nil*. Marked lateral curvature of the spine to the left was also noted. On December 16, Dr. Giles exposed the kidney in the loin under ether, and found that in addition to being freely movable it contained a small calculus, which was cut down on and removed. The calculus was of the "coral" variety. The incision in the kidney was sewn up and the kidney was fixed as high as possible by means of two silkworm-gut sutures. The wound was sewn up in two layers and a drainage tube inserted. The tube was removed on the 18th and the stitches on the 23d. The wound rapidly closed; the patient made a complete and rapid recovery, and was discharged from hospital on January 2, 1902.

CASE II.—*Movable Kidney with unsuspected Renal Calculus; Nephrolithotomy and Nephropexy.*

This case is an almost exact repetition of the last. It occurred in the private practice of Mr. F. F. Burghard, who has very kindly supplied me with the notes of the case to incorporate into this paper.

Jane R., aged thirty-four years, was operated upon on July 30, 1901, for movable right kidney. The only symptoms complained of were severe dragging pain in the back and very troublesome frequency of micturition. No other symptoms of stone had ever been observed. The right kidney was very movable, passing right down into the pelvis. When the organ was grasped between the hands the patient felt sick, but there was no real tenderness.

At the operation a small, hard nodule was felt on the posterior surface of the kidney just external to the pelvis near the upper pole. It was detected when the kidney was brought out upon the loin and grasped between the finger and thumb. A pair of sinus forceps pushed into it detected a stone, which was accordingly removed. It was the size of a small Barcelona nut and was of uric acid.

The kidney was decorticated on the posterior surface and nephropexy performed. No drainage tube was used. The patient made an excellent recovery.

CASE III.—*Movable Kidney with unsuspected Localized Primary Renal Tuberculosis; Partial Nephrectomy and Nephropexy.*

H. C., a married woman, aged twenty-five years, was admitted into Chelsea Hospital for Women under the care of Mr. Bland-Sutton on May 23, 1901, on account of a movable right kidney and a left inguinal hernia. She had had two children and one miscarriage, the last confinement being a year and a half before admission. She had noticed pain of a dragging nature in the right renal region for about six months. This was worse when she walked about. The inguinal hernia, which had been present for many years, had been gradually increasing in size during the past four years. There had never been any disturbance of micturition and menstruation was normal. The urine was acid in reaction, with a specific gravity of 1020, and contained neither albumen nor sugar. It was not examined for tubercle bacilli.

On abdominal examination the kidney was readily felt to be freely movable in the right hypochondrium, and the hernia, which was a left inguinal one, was about the size of a walnut and easily reducible. Ether was administered by Mr. Keith on May 27, 1901, and Mr. Bland-Sutton exposed the right kidney by a lumbar incision. It was found to be freely movable, and on separating it from the surrounding fat and bringing it on to the surface for more careful examination (which is part of the usual routine practice in the performance of nephropexy in this hospital), a dense, depressed scar was observed running across the kidney at the junction of its lower fourth with its upper three-fourths. This was incised and curdy pus exuded, revealing the presence of an old tuberculous cavity. The remainder of the kidney seemed to be quite healthy. The lower pole of the kidney containing the whole of the tuberculous deposit was accordingly excised. Iodoform was freely rubbed into the cut surfaces, and these were then drawn together by a mattress suture of fine silk, the capsule being then sewn up with a continuous fine silk suture.

The remnant of the kidney was then fixed to the posterior abdominal wall, as high as possible, with one silkworm-gut suture. A drainage tube was inserted into the wound, which was stitched up with deep interrupted silkworm-gut sutures, and an aseptic dressing applied.

Attention was now turned to the left inguinal hernia. An incision two inches long was made over the left inguinal canal, and the hernial sac was exposed, separated, opened, explored, ligatured with fine silk, and cut away. The canal was then obliterated by

means of these buried interrupted silkworm-gut sutures, and the skin incision united with a continuous silk suture.

May 29. The temperature rose last night to 100.2° F. The first three specimens of urine passed after operation were deeply blood-stained. The dressings were changed; there was very little discharge on them.

May 30. The temperature last night rose to 101° F., but has now fallen to 99.4° F. Patient has passed twenty-two ounces of urine in the last twenty-four hours. Complains of some pain in the right side. On dressing the wound, no discharge was found on the dressings; the tube was withdrawn, and a shorter one substituted.

June 1. Tube withdrawn. Temperature gradually falling.

June 3. Stitches removed from both wounds; complete primary union except for the track of the drainage tube in the lumbar wound. The temperature now reached the normal and remained so throughout.

Microscopic examination of the removed portion of kidney revealed the typical picture of tuberculosis, viz., and abundance of giant-cell systems, with tubercle bacilli present in the giant cells.

Recovery was rapid and uneventful, and the patient left the hospital well on June 20, 1901.

CASE IV.—*Movable Kidney with unsuspected Hydronephrosis and Congenital Smallness of Ureter; Nephropexy.*

E. J., a married woman, aged forty years, was admitted into hospital under Mr. Bland-Sutton's care on October 10, 1901, complaining of dragging pain in the right side and in the bottom of the back of ten years' duration. She had had ten children and one miscarriage. The last confinement occurred eight months before admission into hospital, and patient says that a tumor of the kidney came down and obstructed the passage of the child. She had had the pain, however, long before this; almost continuously and sometimes very sharp. She had sometimes great difficulty in passing water, but blood had never been passed, and the urine had always been normal in appearance.

On abdominal examination marked tenderness was found in both hypochondriac regions, and a freely movable, but not obviously enlarged, kidney on the right side. On November 4, Mr. Bland-Sutton exposed the right kidney under ether. It was found to be very movable and somewhat flabby. The ureter was

extremely small, and the pelvis of the kidney was somewhat dilated. The kidney was sutured to the posterior abdominal parietes with three silkworm-gut sutures. The stitches were removed on November 11, and the wound had then completely united by primary union. Recovery was rapid and complete, and the patient returned home well on November 21, 1901.

CASE V.—*Movable Kidney; Unsuspected Renal Tuberculosis; Nephropexy abandoned to be replaced by Nephrectomy.*

I must thank Mr. Watson Cheyne for permission to publish this case, to which my attention was kindly drawn by Mr. F. F. Burghard. In it, too, the diagnosis before operation was simply that of movable kidney, and when operation was decided upon, it was not anticipated that anything more than nephropexy would be necessary. Owing, however, to the situation of the tuberculous foci which were discovered on exposing the kidney, nephropexy was abandoned and nephrectomy substituted.

S. B., a thin and pale married woman, aged thirty-nine years, was admitted into the Gynæcological department of King's College Hospital on February 19, 1901, complaining of frequency of micturition. Examination having shown the pelvic organs to be normal, the patient was transferred to the surgical ward under the care of Mr. Watson Cheyne.

The following history was obtained from her: Early in the previous summer (*i.e.*, 1900) she noticed that she was passing water more frequently than usual, although very little was passed at each act. The urine was somewhat lighter in color than usual, and it had never been noticed to contain blood. About a fortnight later the patient began to suffer from attacks of severe stabbing and aching pains in the right loin, which was then tender to the touch. These attacks usually lasted about an hour, and were very acute. The pain would shoot down from the loin to the pubic symphysis. The desire to micturate would suddenly arise, and then be imperative. In the earlier stages of the disease a sickening sensation was experienced on passing the urine, but this symptom had disappeared before admission into hospital. Throughout there has been continual retching, which was very severe during a bad attack of renal pain. The retching seemed to give some relief to the pain. The digestion and state of the bowels were good, but the patient had been losing flesh.

Abdominal Examination.—On inspection of the abdomen

nothing abnormal was noticed. On palpation the right side of the abdomen was found to be exceedingly tender, the slightest touch being sufficient to evoke considerable spasm of the muscles. On palpating the right loin the right kidney could easily be felt. It was so mobile that the edge of the hand could be pushed down between it and the lower margin of the ribs. Manipulating in this region caused the patient to have a most sickening sensation; a similar sensation being produced on pressing the loin, and this did not seem to be increased on handling the kidney. Percussion of the abdomen yielded a good tympanitic note, and the areas of splenic and hepatic dulness were normal.

Operation.—On March 6, 1901, the patient was anæsthetized by A. C. E. The patient was placed on her left side, and Mr. Watson Cheyne made an incision in the right loin from the outer border of the erector spinæ about one inch below the last rib downward towards the anterior superior iliac spine, thus exposing the kidney, which was freed from its surroundings and delivered through the lumbar incision. When thus exposed, some small miliary tubercles were found upon the surface of the outer border of the middle segment of the kidney. An incision was then made along its outer border. This revealed the presence of two small caseating tuberculous foci. The operation of nephropexy was therefore abandoned and the kidney was removed, the ureter being ligatured separately from the vessels in the pedicle. A drainage tube was inserted and the wound sewn up above and below, two loose stitches being inserted into the middle of the wound, to be tied on removal of the drainage tube.

There was some pain and a slight rise of temperature after operation, and the urine for a time contained a little albumen. On March 8 the drainage tube was removed and the two loose stitches tied. The patient was discharged on April 17, when the wound was not quite healed, there being a narrow, deep sinus still present. The patient was otherwise well and was passing the normal amount of urine.

The sinus persisted, and the discharge was so profuse that the patient was readmitted to hospital on March 17, 1902, and the sinus was opened and scraped, no suture being found. She was again discharged on May 3, 1902, when the sinus was still present, though much smaller than before.

From a consideration of these cases, it may be regarded as conclusively proved that a movable kidney is not uncommonly the seat of some lesion,—be it calculus, tuberculosis, hydronephrosis, or other lesion,—which is quite unsuspected from a clinical examination of the case. There undoubtedly exists in the minds of many surgeons much diffidence in undertaking the operative fixation of movable kidneys, arising probably from the lack of discrimination with which the cases have been previously submitted to operation either by themselves or others, and possibly in some cases from faults in the technique of the operation which have led to failure in the relief of the condition. One of these, and one which I think is too little recognized, is fixation of the kidney in some malposition, usually too low down. In properly selected cases, where the kidney is adequately fixed in a good position, that is to say, sufficiently high up, much relief is usually afforded by the operation of nephropexy.

If a patient suffers from a movable kidney which gives rise to definite symptoms, there is absolutely no reason why he or she should not be operated upon and obtain the relief to be derived from a well-performed nephropexy. This is especially the case should there be present any unusual or unexplained symptom, and still more so if any tenderness or enlargement of the kidney can be made out. The cases reported above constitute, then, a plea for the more frequent performance of nephropexy for movable kidney. In performing the operation, however, it is not sufficient merely to expose the kidney and stitch it to the handiest part of the loin in a more or less haphazard fashion, as is not infrequently the case. In every operation the kidney should always be carefully separated from its surroundings and brought to the surface of the loin,—a proceeding which in the case of a movable kidney is seldom attended with any difficulty, especially if the upper pole of the kidney be sufficiently cleared. Having brought the kidney outside the loin, it should be carefully examined both by inspection and palpation. Should the condition of the kidney appear doubtful at any spot, the renal parenchyma should be freely

incised to the necessary extent, otherwise lesions may be overlooked. It may be that such careful examination may reveal such extensive disease, or the presence of disease in such a position as to make hysteropexy impracticable, in which case nephrectomy may have to be substituted for it, as in Case IV of the present series. Such incisions into the renal parenchyma are easily relieved, any tendency to hæmorrhage being readily controlled by a series of well-placed sutures.

TRANSVERSE ECTOPY OF THE TESTIS.¹

BY ALBERT ASHTON BERG, M.D.,

OF NEW YORK CITY,

Adjunct Surgeon to Mount Sinai Hospital.

M. F., thirteen years old, was admitted to Mount Sinai Hospital July 31, 1902. Since his birth he had a left-sided rupture, which was always reducible. On admission, physical examination showed the boy to have healthy internal organs. The right side of the scrotum was poorly developed. There was a large scrotal hernia on the left side. The hernial orifice was large, the epigastric vessels lay along its inner margin. At the bottom of the left half of the scrotum was a fair-sized testicle; its free concave border pointed downward. From its right pole a normal-sized cord passed upward to near the root of the penis, then curved sharply to the left, and was lost near the opening of the hernial ring. On slight coughing, a small mass, size of almond, presented at the left external ring. It could be pulled down into the scrotum. Pressure upon it gave testicular sensation. A cord passed from it into the hernial ring. The right external inguinal ring was very small. No cord could be felt to enter it. On violent coughing, several loops of intestines prolapse through the left inguinal canal, pushing the smaller testicle before them, but not affecting the position of the larger and stationary one.

On August 4, 1903, the writer found at operation for the radical cure of the hernia the following relation of the testicles and their cords. Both testicles and cords were intimately connected with the hernial sac on the left side. Both cords passed through the left inguinal canal. The testicles were of unequal size. The smaller occupied the upper part of the sac, and its cord had a distinct mesentery; it passed up into the left inguinal canal, through the internal ring, across the space of Retzius, to the right inguinal region, whence it descended to the pelvis. The larger testicle lay in the bottom of the sac; its cord passed up into the

¹ Presented at the Genito-Urinary Section of the New York Academy of Medicine, March 18, 1903.

left inguinal canal, and descended on the left side of the bladder to the pelvis. The right internal ring was exposed, palpated, and found closed. The scrotum showed no evidence of division into two compartments. Both testicles appearing normal, and there being no reason for transferring the right testicle into the right inguinal canal and right side of the scrotum, both cords and testicles were treated as one, and the radical cure of the hernia proceeded with by the House Surgeon, Dr. M. G. Seelig. The peritoneum forming the sac was divided transversely at the level of the internal ring, and the peritoneal cavity closed by catgut suture. The peritoneum forming the sac was then split in its entire length, and reflected around both cords and testicles, being, so to speak, turned inside out. Its edges were united behind the cords and testicles by four interrupted catgut sutures. This method of dealing with the sac of a congenital hernia, I have used for three years with perfect satisfaction. It saves time, avoids unnecessary dissection, and does away with the large raw surface of the cord which is left in the old method of dissecting off the sac from the cord. Radical cure according to Bassini completed the operation. Uneventful convalescence. Primary union in the wound. Six months later no return of the hernia. Both testicles movable and in the left scrotal pouch.

Lenhassek, quoted by Kocher and Quervain in the *Encyklopädie d. gesammten Chirurgie*, has described this type of ectopy of the testicle, and has called it "transverse ectopy of the testicle."

OSTEOMALACIA IN THE MALE.¹

BY THOMAS A. DAVIS, M.D.,

OF CHICAGO,

Professor of Surgery in the College of Physicians and Surgeons,

AND

D. J. DAVIS, M.D.,

OF CHICAGO,

Fellow in Pathology in Rush Medical College.

(Clinical Report by DR. T. A. DAVIS.)

THE patient appeared in my clinic at the College of Physicians and Surgeons on November 24, 1902, when the following history was elicited:

S. J., aged thirty-three years; of Norwegian nativity; has resided in this country for twenty-five years; has been married thirteen years, and is the father of three healthy children. His occupation has been that of wood-scroll sawyer in a piano factory. His mother died at the age of fifty-seven, of cancer of the stomach. Father alive; has diabetes. One brother and four sisters alive and well. Four brothers and sisters died in early childhood. One sister is a hunchback.

The patient is a scroll sawyer in a piano factory. His habits are good. Has had the diseases of childhood. Had typhoid at sixteen years of age. Two years ago patient was treated for rheumatism in the feet and ankles. A year ago he suffered some from pains in the upper extremities. There was no swelling of the extremities at that time. There was no pain at night nor when the patient was inactive in the daytime. He felt weak and did his work with difficulty, being exhausted before the end of each day. Pain was present only when patient was at work. Can get no history of there having been any more pain in the arm which is now injured than in other limbs. He has not been laid up from work until the present trouble—fracture—occurred about three months ago.

Additions to history obtained at later date after diagnosis had been made. *Previous History.*—The patient lived in Norway until about nine years of age (near Christiana). His father was a

¹ Read before the Chicago Surgical Society, March 7, 1904.

gardener and lived three miles from town, among healthy surroundings. Came to America, and first located at Mendota, Illinois, where he attended school for one and a half years; then moved to Chicago, Grand and Centre Avenues. Attended school six months; moved then to Pullman, where he attended school for one year, and then went to work in Pullman car factory, machine department, for one year. Work was light. He then moved to Iowa with his parents, where he worked on the farm in the summer and attended school in the winter, for one year. He then moved back to Chicago and began work in the Cable Piano Factory, working at cabinet work, for about a year, and then changed to scroll-sawing, which he has followed for the past twelve years, up to the time of his injury. Always lived among healthy surroundings. No nervous disease on either side of family.

Present Illness.—Eleven weeks ago patient slipped and fell in soft mud while crossing a ditch. In falling he thinks he twisted the left arm, but does not know exactly how. The arm became swollen immediately, and was painful from the shoulder down to the elbow, especially about the middle, which showed a large ecchymotic area. This region was painful to palpation and on motion of either shoulder or elbow. A few hours after the injury the patient was taken to a physician, who strapped the arm to the thorax with adhesive plaster, immobilizing both shoulder and elbow. This treatment was followed for five weeks and then a plaster cast was put on. During the period in which the limb was bound by adhesive strips, the suffering was quite severe. The pains became much relieved by the plaster cast, which was worn for a period of six weeks. The swelling also disappeared during this time.

On November 10, 1902, eleven weeks after the injury, the patient was seen in my clinic at the College of Physicians and Surgeons, in my absence from the city, by my colleague, Dr. Bayard Holmes. A diagnosis of ununited simple fracture of the junction of the lower and middle thirds of the humerus was made and under general anæsthesia the treatment for delayed union—that of attrition of fractured surfaces—was rendered, and a plaster-of-Paris dressing applied.

Two weeks later the patient was seen by me for the first time at my clinic; the plaster cast was removed. An examination of the limb showed the usual amount of atrophy from disuse, and

a flail-like joint at the point of fracture. There was no apparent thickening of the soft structures or of the bone, so that, in the absence of any regenerative evidence, the condition of pseudoarthrosis was considered, and under that diagnosis I proceeded to operate.

Exploration of Fracture.—Esmarch's constrictor was applied and an incision made along the outer anterior surface of the arm. Careful dissection was made to avoid injury to the musculo-spiral nerve and its accompanying vessels. These structures were separated from the surroundings for a short distance for demonstration. The periosteum was found bulging to a slightly increased diameter than that of the normal bone, and on incising it its blood-like contents spurted over the assistants, who were three feet away.

The incision was enlarged to the full length of the sac, which was wiped out with gauze sponges, exhibiting a uniformly smooth and almost glistening white surface. There were two or three scales or spicules of calcareous matter attached to the sac, but no other tissue. The quite extensive rarefaction of bone was at once apparent; the walls of the lower fragment were so attenuated that they offered but slight resistance to digital pressure, feeling like parchment being crumpled by the fingers. The enlarged medullary cavity was filled with material of new blood-clot consistency. The walls of the upper fragment were not so attenuated and the medullary cavity not so large. The contents seemed the same as those of the lower fragment.

Pathological Fracture.—The diagnosis of pathological fracture was made, and portions of the periosteal sac, the bone, and medullary contents were taken for study. The wound was then sutured and a proper dressing applied.

The pseudo-articular fibrous sac found in delayed union of complete fractures exhibits too little vascularity to supply blood in such amount or under such tension. This clinical manifestation simply suggested that the fracture was pathological.

Diagnosis.—During the operation I thought the pathogenesis of the fracture was probably that of a sarcoma, owing to the apparent vascularity of the structure, which furnished so much blood on the not severe manipulative process instituted by Dr. Holmes two weeks previously. I remarked the absence of any tumor structure adherent to the inner surface of the sac, but concluded that in that friable, predominantly cellular structure, small

round-celled sarcoma, the tissue might easily have been completely separated from the sac and pulped by the attrition process heretofore described.

The specimens taken from the case were prepared for microscopical study by Dr. P. B. Conant, interne in the West Side Hospital, who with others, including myself, diagnosed sarcoma. A portion of the microscopically prepared specimen was sent to Professor W. A. Evans, at the Columbus Laboratory, who reported that parts of the field suggested sarcoma, but that he was not satisfied with the mounting of the section, and requested a piece of the original gross specimen for further study. I regretted that we were unable to furnish Dr. Evans with more of the tissue. I took a slide from the same block that Professor Evans had sections from to Professor L. Hektoen at his laboratory in Rush Medical College. Dr. Hektoen examined the specimen, and said that he would not like to make a diagnosis from this microscopic section alone. He later made an examination of the patient in the West Side Hospital without noting evidence of pathological lesion beyond the fractured limb. No diagnosis was made. I am deeply indebted to Professor Hektoen for the interest taken in this case. He kindly offered to assume the responsibility to furnish a pathological report of the case, and the gross specimen was turned over to him, and through his laboratory the excellent work of Dr. Davis was secured, the report of which will follow my own.

Specimens of blood and of bone marrow were taken by Dr. Fred Harris, pathologist of Cook County Hospital. Dr. Harris's investigation was interrupted by his sudden departure for Europe, and no report was received from him.

Urinalysis had been made (November 24) on the patient's entrance to the hospital,—the ordinary examination to know the condition of the kidneys, with the view of determining the selection of an anæsthetic or contraindication to surgical intervention, etc. Such examination showed:

Color, cloudy; odor, normal; sp. gr., 1020; reaction, slightly acid; albumen, slight; sugar, negative; microscope, some pus. (Dr. Conant.)

Blood count was made by Dr. Conant at this time (November 24), showing red, 3,704,000; white, 6800.

Differential Diagnosis.—One week following my first operation, and during the time that others mentioned were studying the

case for diagnosis, I took the patient into clinic again to exemplify the subject of pathological fractures. It was concluded that we had such to deal with because of

(1) The history of the violence which caused the fracture was that of a force which should not have fractured a normal bone.

(2) Non-union in three months' time.

(3) Total absence of manifestation of regenerative effort (no callus).

(4) The pathological findings of the previous operation.

Of the diseases considered, the differentiation was quickly limited to three:

(1) Osteitis deformans (Paget and Osler).

(2) Osteomalacia (so-called rheumatic form).

(3) Myelogenic sarcoma.

Osteitis Deformans.—Osteitis deformans occurs in individuals past forty and is oftenest in advanced age. In looking up the recent literature of osteitis deformans I find that the disease appears earlier. In Morton Price's paper (*American Journal of Medical Sciences*, November, 1902), he mentions Kirkbride's collection of sixty-six cases of osteitis deformans, in eleven of which the disease began before the age of forty. Prince, in quoting from Drs. Packard and Steele, says that in osteitis deformans "the bones become exceedingly thickened and asymmetrical, but since the new bone tissue remains uncalcified, its elasticity permits of great deformity of the long bone from the weight of the body, and fractures do not occur."

Accompanied by moderate rheumatic pains, there gradually develops an irregular nodular thickening of various bones, together with increasing curvature and deformity of the parts exposed to pressure by the weight of the body, namely, the spinal column and the legs.

Microscopic studies of von Recklinghausen and H. Stilling: The disease begins with the absorption by means of Howship's lacunæ and Volkman's canals, and the bone may become very spongy, porous, and even cystic. Simultaneously there occurs growth by apposition from the periosteum and medulla, but the osteoid tissue often remains uncalcified for a long time, so that deformities develop. The nature of the disease is not understood. Richard and Ziegler look upon it as the same process that takes place in joints in arthritis deformans, while Recklinghausen speaks of it as a fibrous osteoplastic osteitis allied to osteomalacia.

Osteomalacia.—"Osteomalacia (mollities ossium, malacosteon, haliteresis ossium) is a chronic progressive disease of adults, characterized by decalcification of pre-existing old bone (haliteresis) and by non-calcification of new-formed osteoid tissue, observed most frequently in pregnant or prolific women (puerperal form), but also in children, women, men (rheumatic form), and in old age (senile form). May be sporadic; endemic in certain Rhine districts."

George Dock (*American Journal of Medical Sciences*, 1895), an excellent paper on osteomalacia, in considering the diagnosis, says: "Like all rare diseases, osteomalacia is frequently not diagnosed. Many text-books make it appear that, in later stages at least, the disease cannot be mistaken;" and he further remarks that it seems desirable that the differential points be alluded to more frequently than they are, in connection with which osteomalacia may be mistaken. "Even in Europe, in localities where the disease is not uncommon, cases are very frequently treated up to a late period for other diseases. Sternberg has recently called attention to the difficulty of diagnosis, and has given the important differential points to be sought for in distinguishing between osteomalacia and the diseases for which it is more easily mistaken."

Dock's observations, after his most careful study of osteomalacia in this country, are of great interest. In his own words, "The peculiar distribution of osteomalacia in various parts of Europe is such as to suggest local causes, and led me to examine the history of the disease in North America. Cases of 'mollities ossium,' 'malacosteon,' 'fragilitas ossium;' and 'ostemalacia' have been frequently reported in the medical journals. I have examined all those under various headings in the Index Catalogue and the Index Medicus, but find that only a small number can be considered as genuine cases of osteomalacia. Most of them are cases of osteomyelitis, caries, tuberculosis, sarcomatosis, cancer, or fragility." He further remarks that "Excluding the doubtful cases of Ellis, French, and Russell, the total number of those reported is only ten; all of these cases were females and whites." "Three of the cases occurred in Massachusetts, two in Ohio, one on an island in the Ohio River, two in Minnesota, one in Virginia, and one in the District of Columbia. All of the patients seem to have been of American birth."

With Dock's case from Michigan, the total number of osteo-

malacia cases reported in this country up to 1895 was eleven, and all of these were females.

The rarity of the affection, and the absence of recognized lesions in other bones, sufficed to render this disease as improbable.

"Myelogenic sarcoma."

(1) Myeloid or central osteosarcoma, usually a mixed-cell tumor.

(2) Richly cellular, round, or, more rarely, spindle celled.

(3) Alveolar.

(4) Myeloma.

(1) The age of the patient.

(2) The frequency of this affection.

(3) The absence of recognized manifestations of the lesion in other bones.

(4) The location of the fracture (in the shaft of long bone).

(5) The demonstration of Bence Jones albumose made by Dr. Conant, who brought the test-tube into this clinic (Bence Jones albumose is found in osteomalacia).

(6) The microscopic and macroscopic findings.

(7) In fact, with nothing apparent to negative sarcoma, that diagnosis was made.

Treatment.—The patient was notified as to the diagnosis, and the advice given him to have the entire extremity removed.

At the instance of his relatives, Dr. Frederick C. Schaefer was consulted with the day before the operation. After due consideration of the history of the case, a physical examination and the microscopic specimen, Dr. Schaefer concurred in the diagnosis, but advised a shoulder amputation instead of that of the entire extremity, on the ground that the pathological fracture was low in the humerus, and there was no apparent involvement higher in the bone. I hesitatingly accepted Dr. Schaefer's advice, and the following day amputated through the shoulder-joint.

Wyeth's pins were used to render the amputation comparatively bloodless.

On opening the shoulder-joint, a yellowish, syrupy liquid to the amount of about a drachm escaped. The head of the humerus exhibited the crackling sensation under the fingers, like that of the shaft about the seat of the fracture; and the shaft below the head was likewise soft. These conditions aroused the suspicion of an error in diagnosis, and immediately on closing the stump the ex-

amination of the bones of the amputated limb was made. I fractured at will, with very slight force, the bones of the forearm and the fingers. At once in my own mind I was satisfied that we had a case of osteomalacia to deal with.

Subsequent History.—Then began the investigation which cleared up the case, from the development of a more accurate history to the conclusive evidence rendered by the pathologist, Dr. Davis.

The amputation was done on December 18, 1902, and four days after, the patient was put on phosphorus, gr. $\frac{1}{100}$, t.i.d., which he continued taking for twelve days, when he left the hospital. Since that time he has taken no medicine, although it was my intention to have the phosphorus continued.

Examination of urine seven days after amputation, December 15, 1902:

Sulphuric acid, three grams; phosphoric acid, five grams; sodium chloride, thirteen grams.

Total amount of urine in twenty-four hours, 1218.75 cubic centimetres.

Test-tube measurements showing percentage of precipitate, 50 per cent.

After the first operation the patient showed no nerve or muscular symptoms, but in a few days there was noted a muscular weakness in the forearm and hand, and, later, complete muscular paralysis. There was no apparent sensory disturbance. The reflexes were normal.

Skiagrams.—Although many skiagrams were made, including the whole skeleton, the work was so poorly done by a novice in skiagraphy, that little value is attached to them. In one picture some of the ribs show tortuosity and but faint outline, the former symptom being, of course, of great significance, the latter being uncertain. I have tried to get the patient to have other pictures made, but could never get him to the hospital again. I ordered a skiagram of the fractured humerus made so that I could use it at my clinic on differential diagnosis. On inquiry for it, I was told that the work had been a failure and the negative had been destroyed. Later I saw a piece of the broken plate (Fig. 1), which had been very well made, but because the outline of the bone was scarcely discernible, it was thought to be a failure and the plate was destroyed.

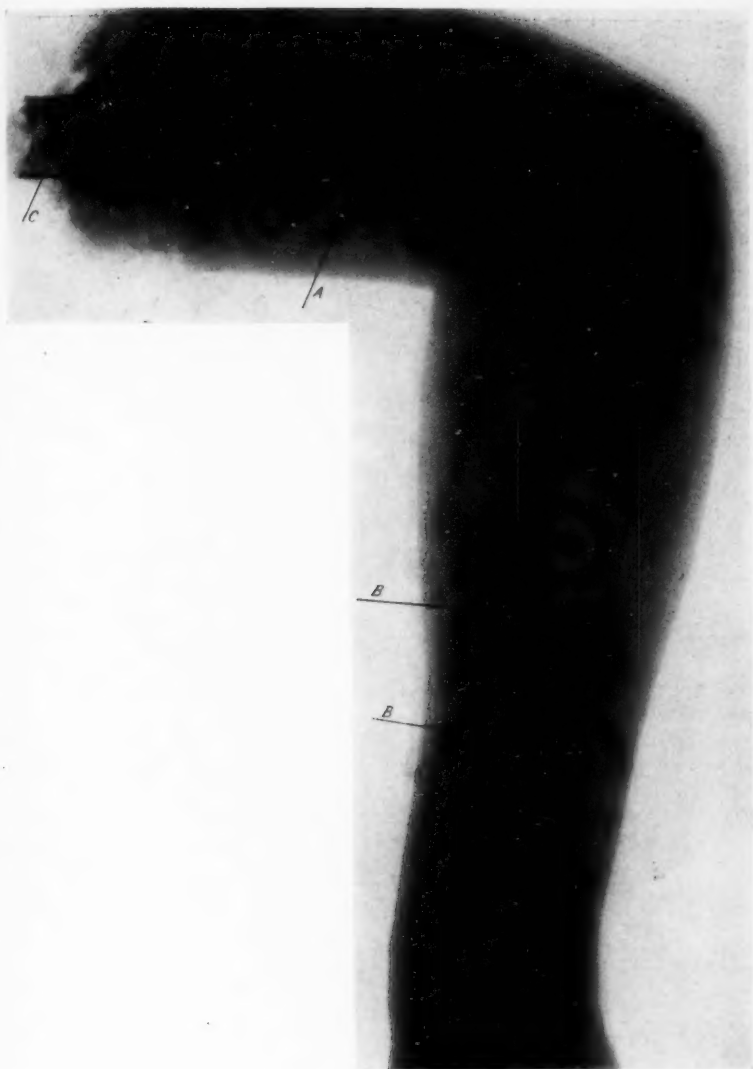


FIG. 1.—*A*, seat of pathological fracture. *B* and *B*, fractures made with slight force after arm was amputated. *C*, mere shell of bone left of upper part of humerus.

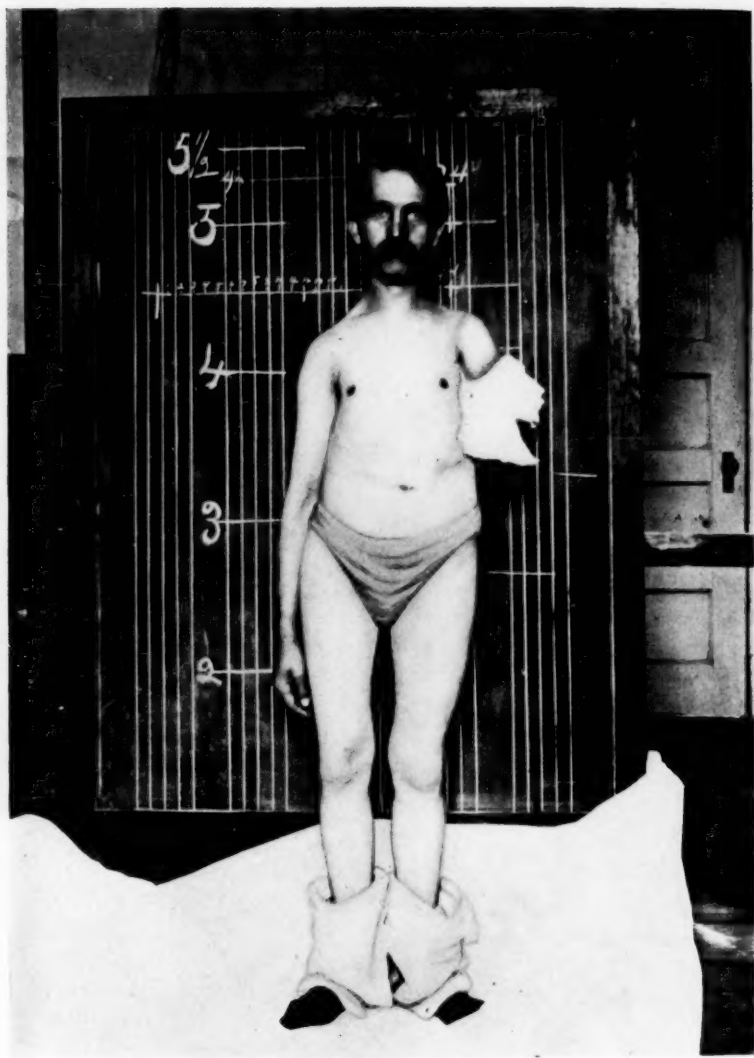


FIG. 2.—Showing lower extremities normal, but narrowing of chest in lateral diameter, and bulging of chest in anterior region.

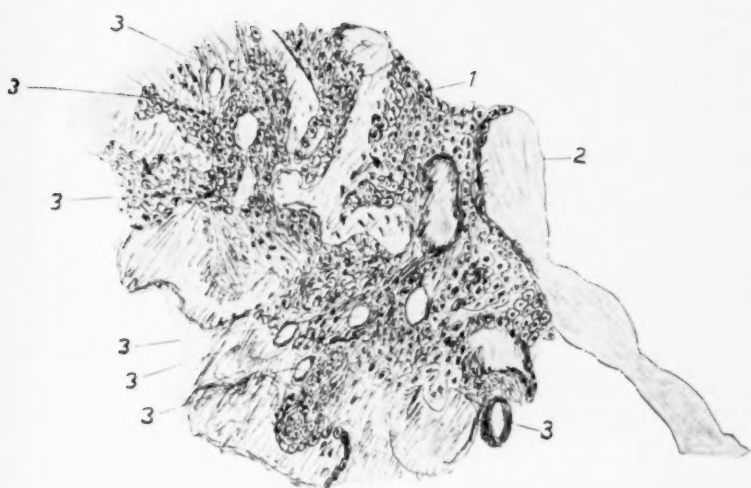
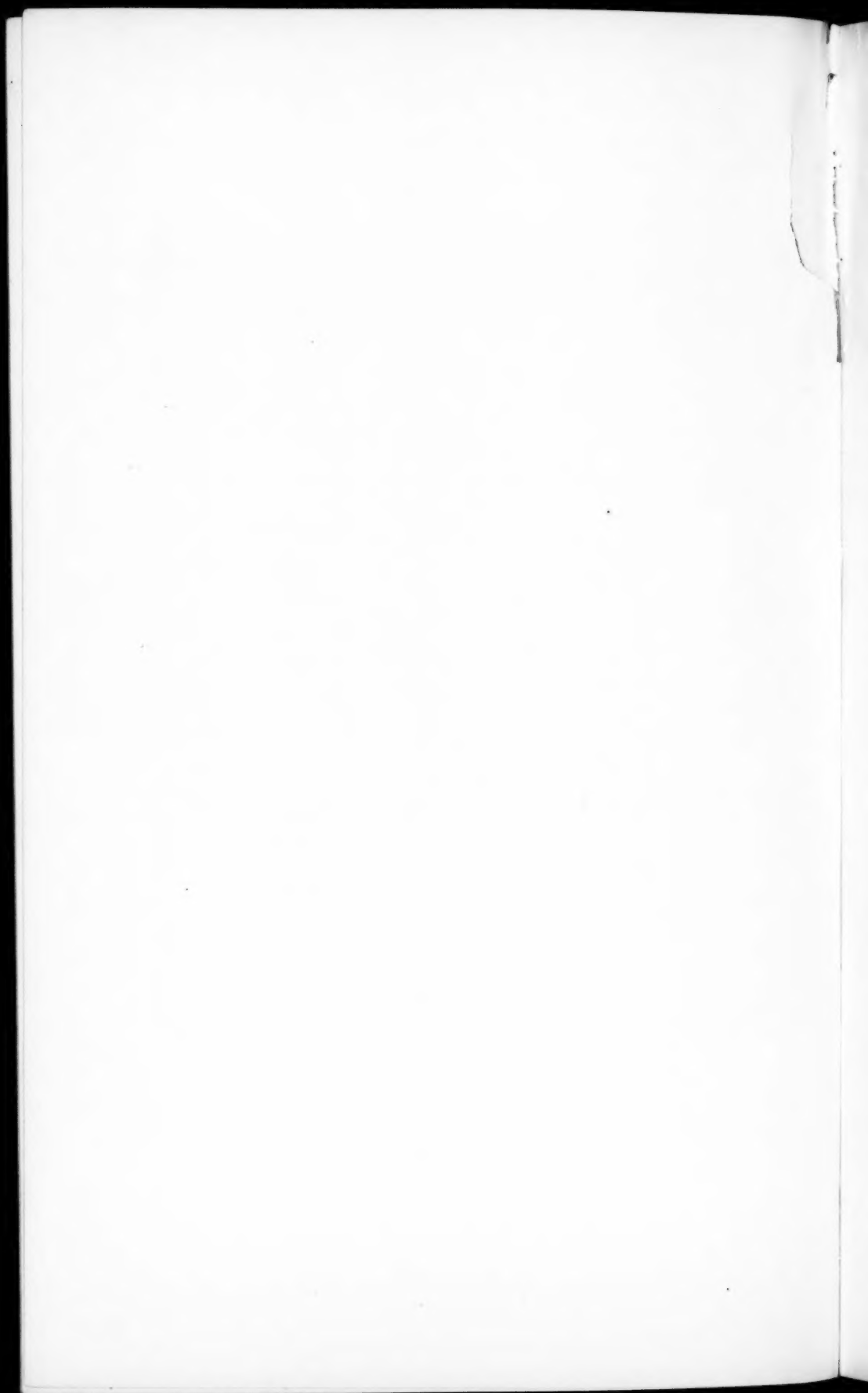


FIG. 3.—Drawing made from first microscopic section of osteomalacia case.

1. Sarcomatous cells.
2. Decalcified bone, due to the sarcomatous tissue infiltration.
3. Blood-vessels that have no wall structure and are just blood-spaces.



Mensuration.—The photograph shown in Fig. 2 was taken for the purpose of comparative mensuration, from which I have not yet made systematic conclusive deductions. The shortened lateral and increased anteroposterior thoracic diameters and the spinal curvatures are quite apparent.

A few days after the amputation, I found undue resiliency of the ribs on the right side. They were the only bones which were palpably soft.

Drawing of Microscopic Specimens.—The drawing shown in Fig. 3 was made by Dr. Conant from the microscopic slide such as was presented to Professors Evans and Hektoen. Suffice it to say that the histological construction observed is that of small round-cell sarcoma, of osteomalacia, or of inflammation, which emphasizes the importance of using but one eye for the microscope, leaving the other free for wider observation.

On February 1, 1903, the patient and his wife visited my office. In answer to my inquiry as to whether she had noticed any change whatsoever, either physical or mental, in Mr. Jensen since she had known him (which has been for the past twelve years), Mrs. Jensen answered: "Well, of course he has been more quiet, and didn't care whether he lived or died."

"When did you first notice such a change?"

"Well, about the time when he first began to have the rheumatism, beginning about three years ago. Years ago he was as straight as any one, and he was very quick at motion; very active. Now he is very stooped, round-shouldered, and very stupid. These changes began to appear about the same time that the rheumatism appeared."

The patient volunteered the information, several months after the operation (January 10, 1904), that he used to walk with a cane on account of pain and weakness in his back, for years before his operation. The occasion for the remark was my inquiry as to how he had felt since the amputation of his arm. He said, "Before I had my operation I walked with a cane; had pains in my spine and limbs. Now I can run a race with any one. I don't have any pains, and don't carry a cane."

The patient has been working in the same piano factory, since shortly after the amputation of his arm, as a wood polisher. His work requires the expenditure of very much more physical force than he had used for years previously. He feels stronger than he has been for three years and seems in good health and spirits.

Remarks.—(1) It is probable that this is the first demonstrated case of osteomalacia in the male reported in North America.

(2) Those who have prescribed phosphorus for osteomalacia have not observed any effect from it until it has been administered for a long time, and as this patient took the drug in $\frac{1}{100}$ gr. doses t.i.d. from December 12–24, 1902, twelve days only, the improvement in his condition is not to be attributed to it.

(3) There can be no doubt but that improvement in cases of osteomalacia has followed oöphorectomy, and no satisfactory explanation of its *modus operandi* has as yet been advanced. It would be interesting to know what influence the operation has had on my case. It must not be lost sight of that the improvement may be only temporary, and the disease may possibly be running its course, without even modification from any treatment. A knowledge of the enormous mortality of osteomalacia renders some relief to the author, who has felt the pangs of discomfort in operating under mistaken diagnosis. J. B. Hellier (London *Lancet*, 1895, i, 807), from Litzman, gives mortality of puerperal form at 70 per cent.; of non-puerperal form, 84.7 per cent.

No history has been found of serviceable union taking place in osteomalacia.

Conclusions.—Retrospectively, taking the symptomatology as completely evolved in this case, the simplicity of diagnosis is quite apparent. With but a slight knowledge of the disease, the inference could scarcely be incorrect. But taken at such a time as that previous to surgical intervention, the diagnosis is not so easy. These were the

Objective Symptoms:—(1) Shortening of stature. (2) Curvature of spine. (3) Barrel-shaped chest; none of which had been noticed by the patient; and the

Subjective Symptoms of Rheumatoid Pains in the extremities and spine, with possible mental manifestations of stupidity and a mild degree of melancholia and myasthenia.

As to the *objective* symptoms, one commonly meets with

them among laboring people without attempting to determine the cause, as to rickets or occupation, etc. There was nothing characteristic about the pains complained of, and it is yet questionable as to the mental disturbance. It is quite clear that there is no individual pathognomonic symptom of osteomalacia, and still authors have expressed astonishment at the late date of recognition, or complete failure to diagnose the disease. At the present time, with no knowledge of the cause of the disease, hence its real nature, it cannot be recognized until advanced bone changes have taken place.

In reviewing the history of a large number of cases, the author finds that the symptoms almost universally mentioned are rheumatoid pains in the extremities and spine, without swelling, accompanied by myasthenia, these symptoms preceding for some months deformity and fracture. With the history of such symptoms, the X-ray should show the lessened density of the bones and serve to establish a diagnosis.

PATHOLOGICAL REPORT BY DR. D. J. DAVIS.

The amputation of the arm, already described, was made at the shoulder, the head and upper part of the humerus at the time of the operation being in a friable and crumbled condition. It was at once preserved in formalin, and later dissected and examined.

Gross Anatomy.—There was some œdema of the whole arm. The muscles and nerves showed no important changes. The blood-vessels were normal, except for a few thrombi in the smaller superficial veins just above the elbow-joint. The epitrochlear gland was slightly enlarged. In the elbow and carpal joints there were small masses of a yellowish, gelatinous substance. This was probably coagulated effusion in the joints. Otherwise the joints appeared normal.

About twelve centimetres from its distal end the humerus presented a complete fracture. The fractured ends were very irregular. There was here only a thin shell of cortex remaining, and this contained but little calcareous matter. Below the fracture for about five centimetres the bone was slightly enlarged and quite firm. Its surface was very irregular, and the mineral salts almost entirely absent. On cross-section the medullary cavity was filled with dark, firm, clotted blood which was undergoing organization,

as evidenced by the strands of light connective tissue penetrating it. Near the seat of fracture occurred cystic cavities filled with a bloody, serous fluid. These changes were apparently incident to the fracture.

Above and below the lesion just described the surface of the bone appeared porous. The cortex was thin and spongy, this sponginess increasing from without inward. The articular extremity of the bone also was very spongy. So little lime salts remained in the bone that it could be easily cut with a scalpel. However, it was not especially pliable or waxy, but rather somewhat brittle. In cutting through the bone it would crack in advance of the knife-blade. Also a lateral strain would break rather than bend it. Most of the marrow of the humerus was dark red, this being due to the blood from the site of the fracture. The bones of the forearm and hand showed the same spongy condition with thinning of the cortex and loss of lime salts. The marrow of these bones was light colored or slightly yellowish in places. There were, however, a few small red areas, some sharply localized, other containing for some distance near the cortex in a linear direction. Near the extremities of the radius and also in the metacarpal bones were found a few small cysts filled with a light-colored, gelatinous material. These were not numerous and none measured over five millimetres in diameter. There were no irregularities or nodosities of any kind observable on the bones. The periosteum was slightly thicker than normal.

The size of the bones was not altered to any great degree. There was no evidence of any osteosclerosis.

Upon boiling a piece of bone for one or two hours it became quite pliable; also when macerated in water or digested with pepsin. Boiling in caustic soda reduced the bone to a friable mass, which fell to pieces on handling. The spongy condition of the bone was brought out very clearly by drying.

Microscopic Anatomy.—Sections were made of the triceps muscle, the musculospiral nerve, blood-vessels, the epitrochlear lymph gland, the humerus, radius, ulna, one of the metacarpal bones, and also from different parts about the fracture of the humerus.

The triceps muscle shows a slight cellular infiltration. The nerve, blood-vessels, and lymph gland appear unaltered.

Sections from the different bones were stained with hæma-

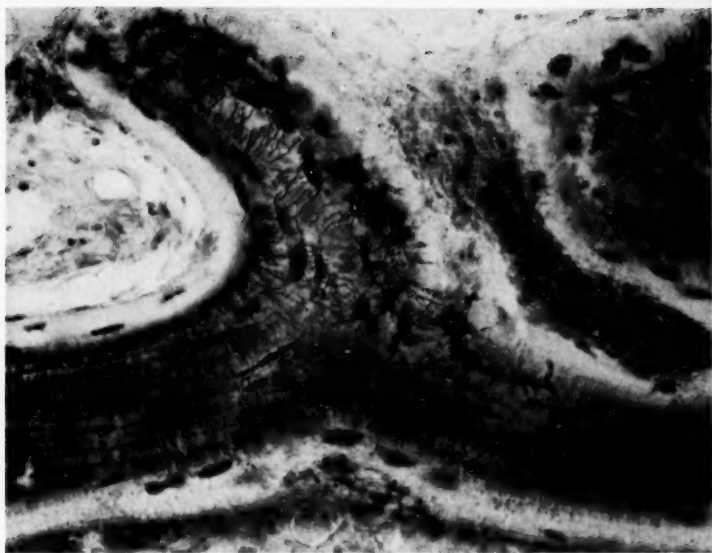


FIG. 4.—Photograph showing zone of osteoid tissue on margin of trabecula of bone. This zone is light colored; contains no canaliculi. Only a few narrow slits, seen on the left, remaining of bone-cells.

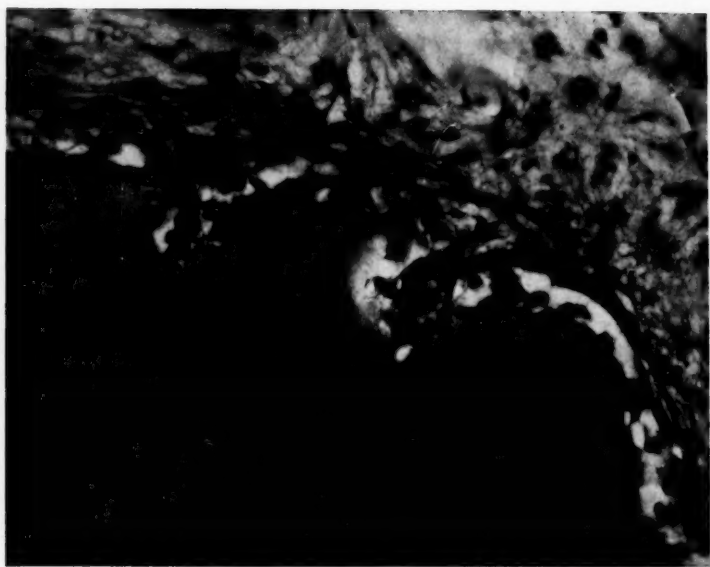


FIG. 5.—Photograph showing recesses into the osteoid margin of the trabecula filled with small round or oval cells.

toxylin, and eosin, hæmatoxylin and carmine, thionin and picric acid (Schmorl's method), and van Gieson's stain.

Sections of the humerus show the bone to be in a very spongy condition, this sponginess increasing towards the medullary cavity. The trabeculæ are thin and far apart, and usually appear as a narrow strip of bone tissue. The Haversian canals are much enlarged. The margin of the trabeculæ stains a deep red with carmine, giving a well-marked "carmine border." With thionin and picric acid the border stains a light yellow, while the central portion stains green and the bone-cells dark red. In this border the bone-cells are small and flat, most of them appearing as thin, narrow slits (Fig. 4). Apparently many have disappeared. No canaliculi are seen here. The carmine border is quite uniform in thickness, measuring from twelve to fifteen microns in width. It is seen practically everywhere on the margin of the trabeculæ. It appears more homogeneous than the central portion, though often a distinct lamellation can be observed. It is entirely devoid of lime salts.

In the interior portion of the trabeculæ the bone-cells are slightly larger than normal. The canaliculi show very clearly with Schmorl's stain. This part of the trabeculæ contains a considerable amount of lime salts. There was little difficulty in cutting sections of the different bones without previous decalcifying. With hæmatoxylin and eosin the interior portion of the trabeculæ stains a deep blue. It is not homogeneous, but appears granular and friable.

Along the margin of the trabeculæ, especially near the periosteum, where the bone tissue is more abundant, there can be seen little recesses into the trabeculæ (Fig. 5). Rarely giant cells are found in these recesses. In most of them is a group of small cells with round or oval nuclei which seem to be streaming in from the surrounding medullary tissue. They are often in close apposition to the wall of the recess, and the border in advance of them seems to be undergoing disintegration. It suggests strongly that a process of dissolution is occurring here. Along the border of the trabeculæ almost everywhere are seen cells, usually elongated, but often globular in form.

The marrow, on the whole, contains a large amount of fat, but near the cortex and between the trabeculæ of bone the space is occupied largely with a loose, fibrous tissue with only a slight

amount of fat. In a few small, localized areas usually near the cortex are seen aggregates of small cells having a round nucleus and a moderate amount of protoplasm, and occasionally a giant cell is seen. In these areas, also, there is some fat. The blood-vessels are not numerous, nor are they congested. In several places there is a slight hæmorrhage into the marrow.

Sections of the humerus near the seat of fracture show the medullary cavity filled with blood, fibrin, and serum, which are undergoing organization. Osteoid tissue occurs here in abundance. Along the margin of this tissue are a large number of osteoblasts (Fig. 6). Occasionally giant cells are seen. In some of the older trabeculæ in this region there are seen to be some lime salts present. Evidently this is the site of a reparative process.

Examination of the radius, ulna, and a metacarpal bone shows that the same condition is present in these bones as that already described for the humerus, the only difference being the changes noted in the humerus brought about by the occurrence of the fracture. Sections taken at some distance from this fracture show changes of the same nature that are general in all of the bones examined.

From the above description we have to do apparently with a case which shows many of the typical findings of osteomalacia. McWilliams speaks of osteomalacia fragilis and osteomalacia cerea or waxy osteomalacia. These are probably only different stages of the same process, the fragility of the bones preceding the waxy condition. From the fragile nature of the bones and the ease with which they are broken we have probably to do with the earlier stages of the disease. The general deficiency of lime salts, the spongy condition of the bones, the small cystic spaces, the very characteristic microscopic appearance, the fatty marrow, all point strongly to osteomalacia. It is to be noted that all parts accessible to examination presented the same spongy condition, and about to the same degree. This is very significant, as it indicates a process that at least has affected the entire upper extremity. Evidences of the process going on in other parts of the body are the curvature of the spine, the irregularities of the ribs as shown by the X-ray, the stoop-shouldered position of the man, and the diminution in stature.

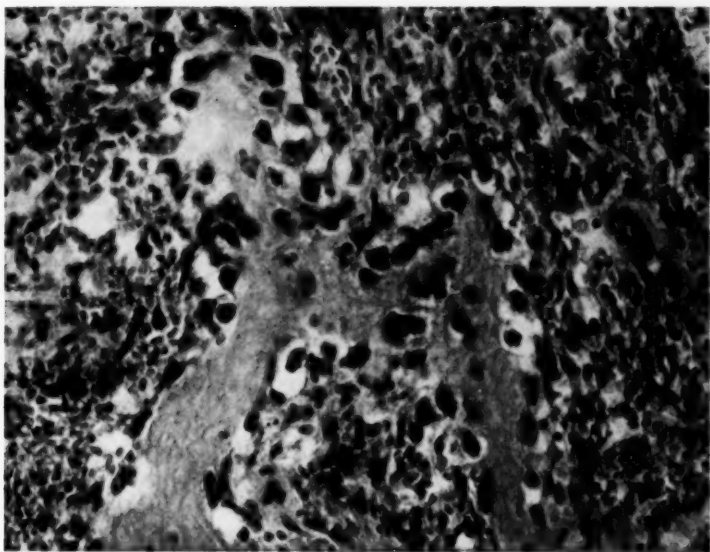
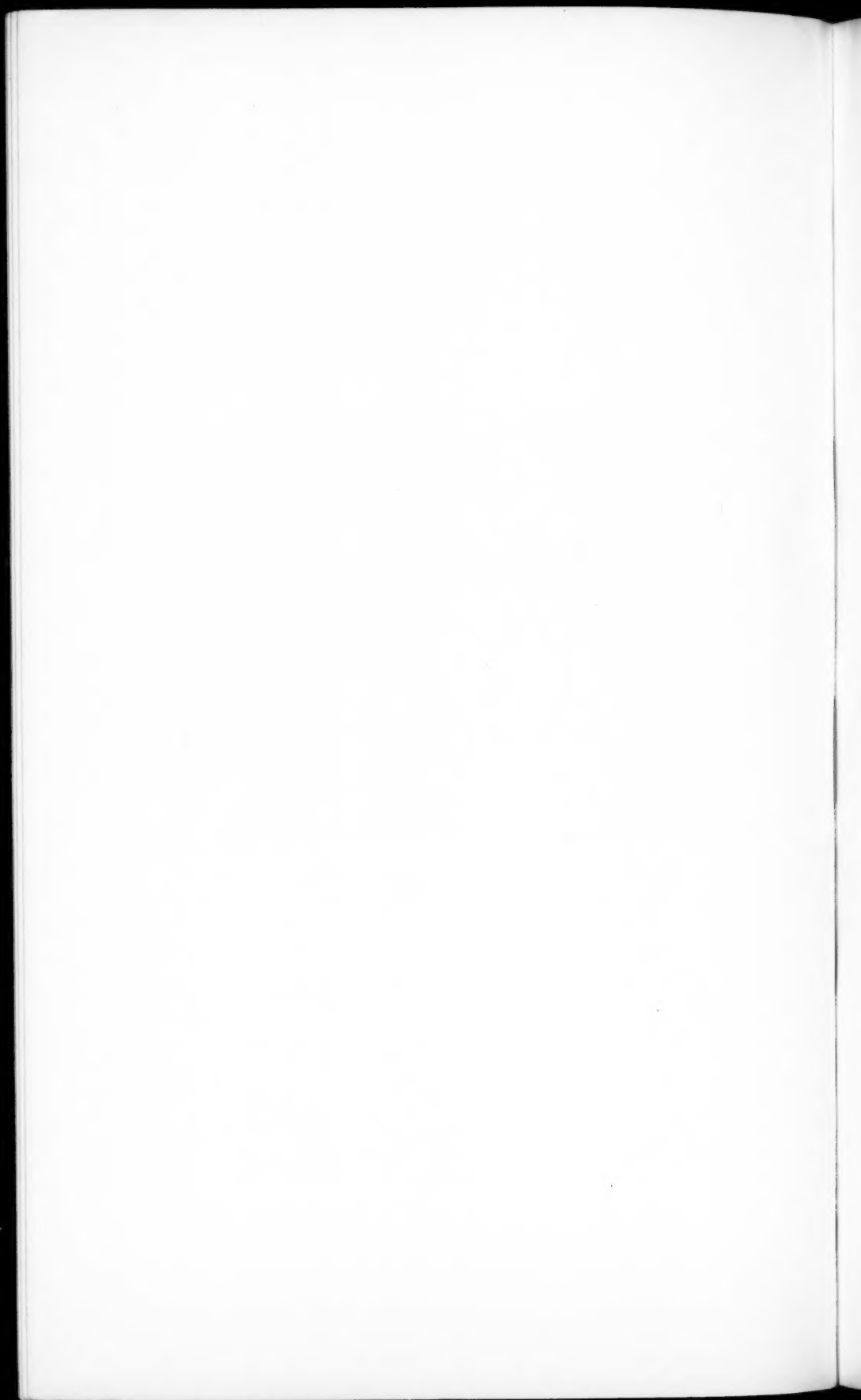


FIG. 6.—Photograph showing the formation of new bone near the seat of fracture in the humerus. Numerous osteoblasts seen on the margin of osteoid tissue surrounded by red blood-cells and connective-tissue cells.



As to the nature of the process in this case we may perhaps obtain a few suggestions from the microscopic findings. The fairly uniform dissolution of bone substance along the margin of the trabeculæ as indicated by the different staining reaction here obtained, the degenerated condition of the bone corpuscles and the absence of canaliculi, indicate that some factor has to do with the solution of bone at the surface of the trabeculæ. This process is commonly known as *halisteresis ossium*. There is also some evidence to indicate that the change is not limited entirely to the margin of the trabeculæ. The central portions, as stated above, appear granular and friable, and the bone-cells slightly larger. This may indicate some abnormal action of the bone-cells themselves.

Just how the solution of bone is brought about is not known. But it would seem safe to assert that it is not due to the action of osteoclasts, for they are rarely seen. One is struck especially by the uniformity of the layer of decalcified, or, as it is often called, osteoid tissue at the margin of the trabeculæ. It would appear that there is first a decalcification of the bone tissues, and later this decalcified tissue is absorbed by some process. That the decalcification is accomplished by means of an acid is a very attractive hypothesis. Rindfleisch in 1864 first advocated this theory. He found that by putting bone into acid for a time he could obtain a carmine border similar to that observed in osteomalacia. He suggested that the decalcification was due to carbonic acid resulting from congestion and stagnation of the blood. This theory has fallen for want of any facts on which to base it. The process of absorption may be explained by the presence of the round cells occurring in the recesses and on the trabeculæ as described above. These cells look very much like osteoblasts. However, they may be engaged in an absorptive process. Gayet and Bonnet, two French observers, have described similar cells in osteomalacia, and ascribe to them the power of absorption. It certainly looks reasonable to assume that the cells are engaged in the disintegration of the already decalcified tissue, and from what we know of such processes it is undoubtedly one of digestion.

The carmine border or osteoid zone is not characteristic of osteomalacia. It has been observed in practically all cases where absorption or rarefaction is occurring. Ribbert found it in bones the seat of tumor, ovaries, syphilis, and senile osteomalacia. Stilling describes it in a case of osteitis deformans.

THEORIES OF THE PATHOGENESIS OF OSTEOMALACIA.

The theories advanced to explain osteomalacia may be grouped under four heads,—the acid, toxic, infectious, and nervous.

Acid Theories.—The decalcification has been ascribed to various acids. Lactic acid has been found in bones and marrow in cases of osteomalacia. Experiments made by feeding animals with large quantities of lactic acid for a long period of time have resulted negatively. As already stated, Rindfleisch suggested that carbonic acid resulting from hyperæmia accumulated in sufficient quantity to cause a solution of bone. In many cases of osteomalacia there is apparently no hyperæmia of the bones. This is true in our case. There are a few red areas, but these are not due to congestion. There is little that speaks in favor of this theory.

Acids resulting from gastric fermentation (Bouchard) and also oxalic acid have been suggested as possible causes, but there is nothing to substantiate such views.

Toxic Theory.—From the large number of successful cases reported after removal of the ovaries in women affected with osteomalacia, it would seem certain that there is some relationship between the trophic disturbances in osteomalacia and these organs. What this is has not been determined. An internal secretion of the ovaries is naturally suggested to explain this. Experiments with animals indicate that the administration of an ovarian extract increases the elimination of phosphates, increases metabolism in general, and in large doses causes death, but softening of the bones has never been produced in this way.

Hyperæmia, excessive development of the blood-vessels, and hyaline changes in the vessel walls have been found in

the ovaries of women suffering from osteomalacia. But these lesions are by no means constant in the disease.

So far as I can learn, no case of osteomalacia in the male has been treated by castration.

Infectious Theory.—Petrone, in 1892, claimed that he had discovered an organism—the micrococcus nitrificans—which produced softening of the bones when injected into dogs, and that this organism was the cause of osteomalacia. Also he claimed to have cured the disease by the administration of chloroform, this substance destroying the microbe in vitro. This work has been completely disproved by the later researches of Fehling, Curatulo, Tarulli, and others.

More recently Morpurgo produced a softening of bones in white rats by inoculation with a diplococcus. The bones showed a typical decalcification. Inoculation of new-born rats produced changes simulating rickets in the human.

Osteomalacia has been observed following puerperal fever, and also following a long suppurating process of the biliary tract in a bitch.

The evidence for an infectious theory of osteomalacia is very meagre, to say the least. While it is a very attractive explanation, much stronger evidence is necessary before the theory can command serious consideration.

Nervous Theory.—No constant lesions have ever been found in the central or peripheral nervous systems in cases of osteomalacia. There are, however, several features of the disease that suggest a nervous origin. The pains in various parts of the body, the general myasthenia, and the change in the mental condition of the patient suggest a nervous trouble. Fehling claimed that a hypersecretion of the ovaries caused a hyperæmia by acting through the vasodilator nerves of the sympathetic nervous system. Then, again, we are familiar with the numerous joint and bone diseases associated with lesions of the nervous system. Also the local softening and porosis that occur in connection with tumors, syphilis, fractures, etc., may be attributed to disturbances of nutrition due to interference with the trophic-nerve supply.

All of these conditions, then, may be grouped together and

attributed to a disturbance of nutrition due to (1) lesions of the central nervous system, (2) lesions of the peripheral nervous system, and (3) causes acting reflexly as the ovarian secretion. This view is strongly emphasized by Gayet and Bonnet.

But it must be admitted that the theory of a trophoneurosis is not satisfactory. It is extremely indefinite. It is but little more than another way of saying that we know nothing about the process; and then there is the danger of contenting ourselves with the application of a meaningless term to the process, instead of pursuing further careful experimentation and observation.

From the above brief *résumé* of the theories advanced to explain osteomalacia, we see that there is none which is satisfactory. It is quite likely that softening of bones is produced in a variety of ways, and that different forms probably require entirely different explanations.

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PHYSIOLOGICAL SALT SOLUTION.¹

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THE use of salt solutions by the hypodermic or intravenous method for hæmorrhage, shock, uræmia, diabetes, cholera, intoxications, autointoxications, septic, and other conditions, seems constantly widening, yet comparatively little attention is paid to the constitution of the fluid used. When attention has been given to the subject, the recipe suggested often shows a failure to appreciate the principles involved. This will be evident when it is stated that solutions containing carbolic acid, alcohol, sugar, sea-water, strong salines, and solutions with every base and acid found in the ash of blood-plasma have their advocates.

It needs no argument to show that a fluid should be used which will not interfere with the performance of the blood's functions nor injure the body cells.

We may take as an index of the effect on cells in general the effect on red blood-cells. If the solution is too concentrated the red cells shrink, if too dilute they first swell and later part with their hæmoglobin.

The question of swelling or shrinking of the cells is not determined by the chemical composition of the fluid or actual weight of dissolved matter, but by its osmotic effect.

The Osmotic Behavior of Blood-plasma and Saline Solutions.—Blood-plasma is such a complex mixture of organic and inorganic ingredients that there is no *direct* method of determining its osmotic pressure. Fortunately, this is of little consequence, since there is such an accurate *indirect* method. This method is based on the fact that two solutions having the

¹This paper contains part of a discourse to the Roosevelt Hospital Alumni Association, February, 1904.

same freezing point have the same osmotic pressure, irrespective of the nature of the dissolved substances.¹ Otherwise stated, the depression of the freezing point of a solution is proportional to the number of dissolved molecules and not to their nature, with this exception, however, that if the dissolved substance dissociates into its ions on going into solution, each ion has the effect of a whole molecule upon the freezing point.*

The freezing point of human blood is -56° C. In health it varies but slightly from this figure in either direction. A depression of the freezing point of $.03^{\circ}$ or $.04^{\circ}$ C. may indicate a considerable renal insufficiency.⁹

The point to be emphasized here is the constancy in health of the freezing point, and consequently of osmotic pressure. Hamburger¹³ has shown that this pressure does not change during hæmorrhage.

Hæmatocrit² determinations of the salt solution in which red cells neither swell nor shrink give .9 per cent. as the proper concentration. A .9 per cent. sodium chloride solution is found, too, to freeze at about the same temperature as blood-plasma. Chemical analyses of the plasma, and computing the sodium as a chloride, give .84 per cent. as the amount of salt in human plasma. From these determinations it is clear that the osmotic pressure of blood is equivalent to that of a sodium chloride solution of from .84 to .9 per cent. concentration.

The writer has frequently performed the following experiment: Defibrinated blood was got from an umbilical cord and one cubic centimetre placed in each of three test-tubes. Then salt solutions were added to make five cubic centimetres of a mixture of blood and salt solution. Such strengths were used that the corpuscles in one were in .9 per cent.; in another in .6 per cent., and in the third in .5 per cent. salt solution. The corpuscles in .9 per cent. solution settle, leaving a clear fluid above. Those in the .6 per cent. solution settle, but make a larger mass, showing swelling of individual corpuscles. The supernatant fluid moreover is colored red, showing a slight

* The osmotic pressure also varies with the absolute temperature.

hæmolysis. The .5 per cent. solution completely destroys the corpuscles and makes a uniform translucent red solution, in other words, *lakes*.

The solution in which complete hæmolysis occurs is said to be .58 per cent.¹

In view of these facts, it seems remarkable that the impression is so widespread that a .6 per cent. salt solution is "physiological." This solution is isotonic with frog's corpuscles, and it seems to have been assumed to be on that account innocuous to human corpuscles.

Experiment as above mentioned will show both swelling of corpuscles and a beginning of laking on placing human corpuscles in a .6 per cent. salt solution.

The Necessity of Sodium Potassium and Calcium Salts in Blood-plasma.—Some years ago Ringer, of Cambridge, noted, in experimenting on the irritability of frog's muscle in solutions of .6 per cent. sodium chloride, that irritability remained longer if he did not use distilled water in making his solutions. Further, he found that the advantage of tap water lay in the contamination of his source of supply with calcium and potassium salts.

Howell³ and others, in experimenting on the heart muscles of frogs and turtles, showed that rhythmic contractions soon cease in physiological sodium chloride solutions, and that after rhythmic contractions have ceased they may be brought back for a time by adding Martius's "alkaline physiological solution." When they have again ceased, the use of a "balanced solution"*—one containing sodium potassium and calcium—causes a return of the rhythmic contractions, which may continue many hours.

Cushing⁴ performed the following experiment on frogs: The aorta was opened and a solution of .6 per cent. salt was passed through the vessels during the time of the experiment. The gastrocnemius was then stimulated through its nerve, and

* The term "balanced" solution has been introduced by Loeb to signify a solution of sodium, potassium, and calcium in proper proportions.

was found to lose its irritability sooner than if no circulation were maintained through the muscles, though, of course, in the muscle stimulated, but without circulation, the waste products of contraction must accumulate in the muscle. After irritability to indirect electrical stimulation had ceased in the muscle with the salt solution circulating through its vessels, it could be made to reappear on adding calcium and potassium to the solution.

We know that calcium is necessary to the clotting of blood and to other body functions, such as the action of rennin on milk. Heart muscle contracting in blood serum is poisoned by addition of enough sodium oxalate to form an insoluble calcium oxalate with the small amount of calcium present.

In an article just published, O. H. Brown¹¹ has recorded some observations which are of interest as further evidence of the physiological importance of calcium in the blood. He anaesthetized rabbits, determined after an hour's anaesthesia that no sugar was present in the urine, and then produced diuresis by infusions of a variety of saline solutions of about the concentration of plasma. Among the solutions used was a physiological sodium chloride one. In nearly every case sugar appeared in the urine. He then added calcium to his infusion solution, and as a result found glycosuria to diminish or disappear. Even after injections of phloridzin, he found that the sugar elimination was diminished by injections of calcium.

Much experimental work has been done, notably by Loeb,⁵ Howell,³ and others, to show the part played by the calcium, sodium, and potassium, respectively, in the plasma. Howell's conclusion is that the sodium maintains the proper osmotic relations between the body cells and fluids, that the calcium is the stimulating agent to heart muscle, and that potassium is essential to its rhythmical contraction and relaxation. At any rate, calcium and potassium, though present in such small quantities in the plasma, are much more abundant in body cells, and without the small quantity in the plasma these metals would be dissolved out of the cells.

These small quantities of potassium and calcium in plasma are not then to be looked upon as accidental, but essential constituents of it.

The Reaction of Blood.—Blood is always and necessarily alkaline. This alkalinity is essential to its carbonic-acid carrying power; it neutralizes the sarcolactic acid formed in tissue metabolism, and is related to its bactericidal action. Thus, conditions such as diabetes, with lessened alkalinity, show lessened resistance to incursions of bacteria.

The alkalinity of plasma is due to phosphates and carbonates, and is equal to that of a .35 per cent. sodium carbonate solution.

The Quantity of Sodium Potassium and Calcium in the Blood.—In Table I the amount of sodium potassium and calcium given in the analysis of plasma contained in Schaefer's "Physiology," Vol. i, page 153, have been taken and computed as though entirely combined as chlorides.

TABLE I.

THE QUANTITY OF SODIUM, POTASSIUM, AND CALCIUM OF BLOOD-PLASMA, CONSIDERING THEM AS TOTALLY COMBINED AS CHLORIDES.

	Per Cent.	Grammes per Litre.	Grains per Quart.
Sodium chloride .....	.84	8.4	129.
Potassium chloride .....	.06	.6	9.2
Calcium chloride .....	.032	.32	4.9

It will be noted that the amount of sodium chloride, .84 per cent., is less than the figure given as "physiological." The difference between .84 and .9 per cent. probably represents the amount contributed to the osmotic effect by the many other compounds of the plasma.

For practical purposes, it will be best to consider the saline equivalent of plasma as .9 per cent., nine grammes to the litre, or 138 grains to the quart.

In Table II there is given for comparison in the first column the saline constitution of plasma based on analysis, and in the following columns, solutions suggested or used for infusion.

TABLE II.

CONSTITUTION OF "PHYSIOLOGICAL" SALT SOLUTIONS IN USE BY SURGEONS.

	Per "Normal Salt Cent. Solution."	Ringer.	Miku- licz.	Hal- stead.	Tavel.	Szu- mann.	
Sodium chloride ...	.84	0.6	.8	.9	.9	.75	.6
Potassium chloride..	.06	..	.03	.01	.03	..	..
Calcium chloride ..	.032	..	.026	.02	.01	..	..
Alkalinity reckoned as							
sodium carbonate	.35	..	..	..	..	.25	.1
Water	100	100	100	100	100	100	100

Referring to column one it is to be noted that we cannot have calcium chloride and sodium carbonate present in the same saline solution, as the calcium would be precipitated as a carbonate. The addition of phosphates and sulphates to the solution has its advocates, as these are present in plasma, but this seems unnecessary, as we cannot be sure that our mixture of bases and acids will combine in the same way as in blood-plasma.

In column two is placed the solution in most general use, and it may be noted that it is far from physiological. Column three shows the solution suggested for use in mammals by Ringer, and is based upon much physiological experimentation.

Mikulicz's solution seems too weak in potassium.

Column five shows the solution which Bloodgood⁷ says was introduced by Cushing three years ago in Halstead's clinic, and which has given entire satisfaction. As a reason for the small calcium percentage, Bloodgood refers to the experiments of Dawson⁶ on infusion after hæmorrhage in dogs. Four dogs which had been infused with Ringer's fluid died, and Dawson thinks the .026 per cent. calcium may have been responsible for their deaths, and advised a less percentage. Two or three times this quantity of calcium has, however, been used in animals without disastrous results, so it would seem that something else must account for his fatalities.

The next solution was devised by Tavel¹² for irrigating wounds, but has been used by others for infusion.

Szummann's fluid is moderately alkaline, but somewhat hypisotonic.

Hypisotonic Infusions.—When a solution such as a .6 per cent. NaCl one is used intravenously, the excess of water necessary to restore the normal osmotic relations may be excreted; fluid may be taken up by the tissues or salts from the tissues may pass into the blood. That the former occurs is apparent when we note the effect of such a solution in a case of hæmorrhage. An infusion of a few hundred cubic centimetres often throws the patient into a profuse sweat even if the temperature be normal or subnormal at the time.

Moreover, there is the likelihood of some hæmolysis if the fluid is thrown rapidly into a vein.

No doubt such solutions have often saved life, but the writer thinks that the more nearly "physiological" solutions would be of greater value. If only a small infusion as compared to the total amount of blood is given, if, further, it is given hypodermically, dilution of the plasma is negligible. But, recalling the constancy of the freezing point of normal plasma, we may be sure, if any dilution or change in proportion of salts occurs, every effort will be made by the body to restore the normal conditions. When we use large and frequently repeated intravenous infusions, it would seem essential that the fluid used should be as nearly as possible "physiological."

This point is mentioned because there is a tendency to combat a variety of intoxications, septic, uræmic, etc., by large infusions given every four to six hours. During the administration of the infusion and for a time afterwards, the pulse may be thought to improve, but may not the reaction, when improper salt solution is used, from hæmolysis, impaired irritability of protoplasm, or profuse sweating, leave the patient in a worse state than before the infusion?

Drainage of the peritoneal cavity in cases of diffuse spreading peritonitis is much less practised than formerly, chiefly because we are *unable* to drain any large part of the cavity for more than a few hours. Instead, we irrigate with large quantities of fluid to remove mechanically the bacteria and toxins and as far as possible to dilute the remainder. We rely on the peritoneal epithelium to combat the remaining in-

fection. We should aim to injure these cells as little as possible, hence the contraindication to the use of antiseptics. But when large quantities of fluid flow over peritoneal surfaces for a considerable time, and the amount of salt is too little, swelling of cells and diminution of bactericidal power must result.

The following statements seem warranted from what has gone before or on the basis of experimental work to which reference is made at the end of the article.

1. It is better not to call a solution used for infusion "normal salt solution," as "normal solution" has a definite chemical significance in no way related to the solution under consideration. Even "physiological" solution admits of some ambiguity. For instance, such a solution for use in the conjunctival sac should have a concentration of 1.4 per cent., since that is the concentration of human tears.¹

2. Theoretically, we cannot make a perfectly physiological salt solution, though we can make one to answer every practical purpose. As before mentioned, we cannot have one alkaline and at the same time containing calcium salt.

3. Hypodermoclysis is preferable to intravenous infusion when carefully prepared solutions are not available, as in emergency.

4. The water used should be clean, if possible filtered, but not necessarily distilled.

5. Table salt can be used for an emergency solution. This contains, as a rule, besides sodium chloride, calcium* as a chloride or sulphate and magnesium similarly combined. Eight analyses of salt referred to showed 93 to 98.8 per cent. of sodium chloride. An analysis of common salt from Central New York showed no potassium, .1 per cent. CaSO_4 , .25 per cent. CaCl_2 .

6. An emergency solution should contain as nearly as possible 138 grains of sodium chloride to the quart.

* Pure sodium chloride is not deliquescent. The deliquescence of table salt is due to its calcium.

7. Where large quantities of salt solution are used, it is convenient to make the "physiological" solution by adding a *measured* quantity of a concentrated stock solution to sterile water. Where it is needed in small quantities, it is convenient to have bottles prepared containing the chlorides in proper quantities to make a "physiological" solution when added to a litre or quart of water. Measuring out salt in a teaspoon to make a solution is too inaccurate.

8. In emergency accuracy is not essential, especially if but one infusion is given. Harm can be done if large and frequent intravenous infusions are used which are not "physiological." A chill and rise of temperature simulating a malarial paroxysm have been frequently noted after infusion.

Cushing⁴ suggests that the cause may be the same as in malaria, namely, a destruction of red cells.*

9. After hæmorrhage, the purpose of an infusion is to supply the vessels with fluid. This fluid is only partly retained if the solution used is too dilute, but is lost through skin and kidney. The sweating may further reduce a normal or sub-normal temperature. The writer wonders if the fall of temperature often noted after infusion in septic cases is not to be explained by the sweating out of a too watery fluid.

10. In septic cases infusion is certainly indicated if fluid cannot be absorbed through the usual channels. Much has been said in favor of infusion in order to dilute poisons and to hasten the elimination of bacteria and poisons through the kidney. In so doing, it is to be remembered that the antibodies are equally diluted, and that the benefit can only apply to soluble poisons when not already in combination with tissue cells. Experimental evidence is somewhat conflicting as to the value of infusion in septic conditions, but clinical evidence seems to show its value in a variety of bacterial and non-bacterial intoxications. Under these circumstances frequent

* Substances may be injected into the blood which produce hæmolysis of red cells, yet no rise of temperature. This makes it doubtful whether malarial fever is due to hæmolysis.

infusions may be needed, hence the importance of "physiologically balanced" fluids.

11. When large quantities of fluid are used in the peritoneal cavity, they should contain calcium potassium and sodium and in the proper proportions.

12. There seems to be no valid reason for administering infusions or peritoneal irrigations at a temperature higher than that of the blood. A fluid given ten or twelve degrees hotter than the blood cannot by its own heat raise body temperature more than a quarter of a degree. When fever is present, there can be no reason for using a hot solution, nor does it seem likely that peritoneal epithelium would be favorably influenced by subjecting it to a temperature ten degrees above that at which it ordinarily functionates. Thrombosis in the median basilic vein might follow the heating of its wall to this extent. Of course, the infusion fluid cools several degrees in passing through the tube to the vein.

13. As Bloodgood has said, every surgeon should supervise the making of the salt solution which he uses.

From inquiries as to the method of preparing salt solution in various New York City hospitals, it has been discovered that when the surgeon calls for "normal salt solution," thinking, no doubt, to get a .6 per cent. solution, he is in reality, in some instances, getting as low as .5 per cent., in others as high as 2.2 per cent.

14. When accuracy is obtainable in the preparation of the fluid for infusion, it would seem that the following two solutions meet the indications, so far as we know them at present, for a "balanced" and "alkaline" physiological solution respectively.

	Per Cent.
A. Sodium chloride .....	.9
Potassium chloride .....	.03
Calcium chloride .....	.02
Water	100.
B. Sodium chloride .....	.75
Sodium carbonate .....	.25
Water	100.

The Choice of a "Balanced" or "Alkaline" Fluid.—The alkaline fluid given above is Tavel's¹² solution, as already mentioned, recommended by him for wound irrigation. This solution he recommended for the purpose because bacteriological investigation showed it to have a marked inhibiting effect on bacterial cultures. Furthermore, it is of about the same reaction as the blood, and we know that the maintenance of this reaction is important in combating sepsis.

But Kuttner has recorded certain bad results following its hypodermic use. He reports six cases of gangrene of the skin at the site of injection of this salt soda and none in his experience when sodium chloride alone was used. It is a fact, however, that gangrene may result from injection of too large a quantity of a solution, even a physiological sodium chloride one, especially if given in dense tissue. Tissue anæmia is probably an important factor in the production of this gangrene.

Kuttner¹⁴ gives experimental evidence to show that the soda is responsible for the gangrene. He made injections of sodium chloride and "salt soda" solution in animals, giving each animal an injection of "salt soda" on one side the body and an equal quantity of sodium chloride solution on the other side. He uniformly noted that it took a longer time for the "salt soda" to be absorbed. He then made injections of more concentrated solutions of salt soda and sodium chloride. The stronger salt soda solutions produced gangrene of the skin, while the sodium chloride solutions did not. In spite of these experiments it seems hard to understand how a solution a little less alkaline than blood-plasma and of osmotic pressure * equal to that of plasma should be irritating. Further, it is only asserted that gangrene resulted six times, though the solution was often used, and in the *experiments* where gangrene resulted the concentration of the soda used was much above .25 per cent.

However, since we know the importance of calcium and

* Dr. Francis C. Wood has frozen this solution for the writer and has found that its freezing point is very close to that of normal blood.

potassium in body fluids, and since no practical objections have been raised as in the case of the alkaline fluid, it would seem wise to use sodium, potassium, and calcium in our salt solution for routine use.

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TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 23, 1904.

The President, HOWARD LILIENTHAL, M.D., in the Chair.

GUNSHOT WOUND OF THE INTESTINES.

DR. LEWIS A. STIMSON presented a man, twenty-two years old, who was admitted to the Hudson Street Hospital on January 2, 1904, about midnight, suffering from a penetrating gunshot wound of the abdomen, which he had received in a brawl shortly before the time of his admission. The point of entrance of the bullet was just above the tenth rib, a little to the outer side of the left mammary line. Ten hours after receipt of the injury, the abdomen was opened through a transverse incision, about six inches long, made close below and parallel to the twelfth rib on the left side. Upon exploring the track of the bullet, it was seen that the direction taken by the missile had been downward, backward, and inward. Blood-clots were found in the peritoneal cavity, and an examination of the intestines revealed a perforation of the descending colon near the splenic flexure. This involved all the coats of the gut, and was closed with interrupted silk and Lembert sutures. No other perforations were found. The point of exit of the bullet from the general abdominal cavity was found to be just adjacent to the lower pole of the left kidney, taking a course towards the deep spinal muscles, in which it had become embedded.

The peritoneal cavity was irrigated with normal salt solution; the peritoneum was brought together with continuous catgut

sutures, and the external wound closed, with drainage. The wound of entrance was packed with iodoform gauze.

In addition to his abdominal wound, a second bullet had inflicted a superficial wound over the sternum. The patient was discharged cured on February 5, 1904.

Dr. Stimson presented a second patient, a man, twenty-three years old, who was admitted to the Hudson Street Hospital on January 7, 1904, at 11.30 P.M., suffering from a gunshot wound which he had received in a quarrel a short time before his admission. The bullet had entered in the sacral region, half an inch to the left of the median line, and just above the intergluteal fissure. It had traversed the general abdominal cavity and could be felt under the skin on the right side, just above the inner end of Poupart's ligament.

The patient's general condition was good, and he was operated on about eleven hours after the receipt of the injury. A combined transverse and longitudinal incision, six inches long, was made anteriorly, its centre close above the symphysis pubis. Upon exploring the abdominal contents, the first perforation found was a single one in a loop of small intestine. This was closed in the usual manner. Two double perforations of the intestine were then found, evidently caused by the bullet passing through a knuckle of gut. Through the perforations in the gut, its greenish, spinach-like contents exuded freely, contaminating the abdominal cavity. After suturing the perforations, the abdominal cavity was sponged out and then flushed with normal saline solution. The wound was closed, with drainage. The posterior wound of entrance was drained with iodoform gauze, and the bullet was removed through a small anterior incision through the skin.

The patient made an uneventful recovery, and was discharged cured on February 5, 1904.

In reply to a question as to how thorough a search should be made for perforations in dealing with these cases, Dr. Stimson said he did not favor complete evisceration of the abdominal contents unless there were special indications demanding it. There was certainly an advantage in not eviscerating a patient, or exposing too much of the abdominal contents. He usually limited himself to an examination of the loops in the immediate neighborhood of the line traversed by the bullet, and he could not recall a case in which he had overlooked a perforation.

RECURRENT CARCINOMA OF PAROTID; LIGATION OF BOTH EXTERNAL CAROTIDS; EXCISION; X-RAY.

DR. BENJAMIN T. TILTON presented a man of fifty-five years who two years ago first noticed a swelling in the left parotid region. This gradually grew larger, until it attained the size of an adult fist. It was very painful, became ulcerated, and bled easily.

About a year after its appearance he applied for relief at Bellevue Hospital, but the surgeon in charge of the division at that time evidently regarded the case as inoperable, and the patient was transferred to the Metropolitan Hospital on Blackwell's Island, where he was operated on in February, 1903. He left the hospital six months later (July, 1903), and at that time there was already a recurrence at the site of the operation about the size of a walnut.

On September 22 he was readmitted to Bellevue Hospital, and when Dr. Tilton first saw him at that time, the tumor had grown to the size of an orange. It was hard and ulcerated, and bled very readily. The pain it gave rise to was so severe that the patient could not sleep, and his general health had become much impaired. There was left facial palsy, which had followed the first operation.

Operation by Dr. Tilton, September 30, 1903. On account of the vascularity of the tumor, and also with the hope that it might assist in preventing a recurrence, both external carotids were tied as a preliminary step. A circular incision was then made around the growth, extending across the cheek and neck, upward through the lobule of the ear and posteriorly about an inch above the tip of the mastoid. After removing the growth as thoroughly as possible, the actual cautery was freely applied to any suspicious looking tissue that had to be left behind. The operation was almost bloodless. The extensive wound cavity that was left was allowed to granulate, and five weeks later the granulating surface was covered with skin-grafts taken from the patient's leg.

Subsequent to the operation, beginning on December 1, 1903, four applications of the X-rays were made, each of ten minutes' duration, with the idea of preventing any recurrence. On December 26, under cocaine anæsthesia, a slightly enlarged gland was removed from the neck in the region of the ligated external carotid. This was submitted to a pathologist, who pronounced it carcinoma. The pathological report on the original tumor had been mislaid,

but the malignancy of the growth was shown by the very rapid recurrence following the first excision at the Metropolitan Hospital.

Dr. Tilton said that six months had elapsed since his operation, and there were thus far no signs of a recurrence. He attributed this favorable outcome to the wide excision, the free use of the actual cautery, and the ligation of both carotids.

Dr. STIMSON said the result was a very brilliant one, and inspired the surgeon with perhaps needed confidence in attacking such an unpromising case. He thought that while it was unfortunate that the report of the pathologist upon the character of the original tumor had been lost, the examination of the gland subsequently removed was sufficient, in addition to the history, to establish the character of the growth.

Dr. WILLY MEYER said he thought that the free use of the Paquelin cautery was an important factor in the immunity from recurrence enjoyed by Dr. Tilton's patient. He recalled the case of an old man of seventy-five with a large, ulcerating carcinoma of the parotid which was so far advanced that a radical operation was inadvisable. In order to give the patient some relief, however, it was decided to remove as much of the growth as possible with the knife and sharp spoon, and after this was done the site of the growth was covered with small pledgets of cotton soaked in a 50 per cent. solution of chloride of zinc. These were left there for about a week and produced a far-reaching eschar. The patient did not have a recurrence for over a year after the operation, when he died from apoplexy.

FRACTURE OF THE SPINE.

Dr. ROYAL WHITMAN presented a man, thirty-five years old, who three years ago fell down the hold of a ship, striking on his spine. He was able to walk after the fall, but only with great difficulty. He was assisted to his home, and remained in bed for six weeks, suffering from pain and stiffness in the back. Subsequently, he applied for treatment at the Hospital for Ruptured and Crippled, and an examination at that time showed a distinct angular kyphosis of the spine, evidently due to forcible compression of one of the vertebral bodies in the lower dorsal region. A plaster-of-Paris jacket was applied, and the patient had since been able

to resume his work as a long-shoreman and was apparently in excellent health.

Dr. Whitman said he had seen a number of cases of this form of fracture of the spine, and in all of them a recovery had followed. The diagnosis was very important, because on account of the angular deformity that resulted, and the pain and stiffness, such a case might readily be mistaken for one of Pott's disease. He said, also, that many physicians were unwilling to admit that the spine might be fractured without more serious symptoms and consequences.

In reply to a question, Dr. Whitman said that paralysis had not followed the injury in this case.

Dr. LILIENTHAL said he thought it would be a very difficult thing to crush bones that were held apart by the elastic intervertebral disks; and it seemed to him that the partial crushing of two or more of these disks might cause just such a deformity as was present in the case shown by Dr. Whitman. He suggested that an X-ray picture might show the real state of affairs.

Dr. WHITMAN said it had actually been demonstrated that these bones were at times crushed. The deformity was so localized and angular that the crushing of the intervertebral disks would hardly account for it.

Dr. STIMSON said that at the Hudson Street Hospital these cases of marked kyphosis, without apparent symptoms, were not infrequently seen. The lower dorsal or upper lumbar region was the part of the spine generally affected, and in the history of the cases marked ventroflexion was usually a factor in the production of the injury. The intervertebral disks probably became absorbed, so that the bodies of the affected vertebræ were sometimes found fused into one mass.

THE COMBINED TRANSVERSE AND LONGITUDINAL INCISION IN LAPAROTOMY.

Dr. LEWIS A. STIMSON read a paper with the above title, for which see page 178.

Dr. CHARLES L. GIBSON said that in the limited number of cases in which he had had the opportunity to use this incision, the result had been very satisfactory. In all of them the chief factor that prompted him to resort to the method was the desire of the patient to get as good a cosmetic result as possible.

DR. TILTON said he had used the combined transverse and longitudinal incision in twelve cases, seven of them double pyosalpinx, while the remaining five were cases of ventral fixation. In all of them the result was extremely satisfactory. At first he was rather appalled by the size of the space laid open for possible infection, but none had occurred in his experience. The method was especially favorable in ventral fixation, where the wide exposure gave ample opportunity for suturing the uterus to the recti muscles. The easy retraction of the parts was particularly noticeable in fat subjects. The scars that remained showed no tendency to broaden, and were extremely satisfactory in their ultimate appearance. The method became easier with practice, and the length of time it required was not much greater than that required for the usual incisions. The method deserves more general trial and is capable of more extensive application.

NEPHRECTOMY FOR TUMOR OF THE KIDNEY.

DR. FREDERICK KAMMERER presented a specimen, which was removed a few days ago from a child six years old. Very little could be learned regarding the past history of the case. When the patient was brought to St. Francis's Hospital, a large tumor was found, completely filling the left side of the abdomen in the region of the kidney. An incision was made parallel to the lower border of the ribs and extending from the spinal column forward to the median line, laying open the retroperitoneal space and at the same time opening the peritoneal cavity. The tumor had evidently started from the lower pole of the kidney, necessitating a nephrectomy.

VOLVULUS OF A PAROVARIAN CYST, WITH THE CORRESPONDING TUBE AND OVARY.

DR. KAMMERER presented a specimen removed from a young woman of twenty-three, with no previous history. About thirty-six hours before her admission to the hospital she had been seized with severe pains in the abdomen. Her temperature on admission was 102° F. There was a fluctuating tumor immediately above the symphysis. On opening the abdomen, this proved to be a parovarian cyst in a state of beginning gangrene. Together with the entire tube, the ovary, the infundibulopelvic and the broad liga-

ments, the cyst had been twisted to the extent of 180° to the left. There was a sharp line of demarcation running along the base of the broad ligament, ending on one side at the junction of the tube with the uterus, on the other at a point several inches beyond the reflection of the infundibulopelvic ligament. This necessitated a rather high ligation of the ovarian vessels.

Dr. Kammerer said that twists of a well-defined pedicle were of frequent occurrence in parovarian and dermoid cysts, but he thought that those involving the entire broad ligament were rather rare.

Stated Meeting, Wednesday, April 13, 1904.

The Vice-President, DR. GEORGE WOOLSEY, in the Chair

RECURRENT VILLOUS CARCINOMA OF THE BLADDER.

DR. CHARLES L. GIBSON presented a man, sixty-three years old, who was operated on by Dr. Edward L. Keyes in 1891 for a "villous" tumor of the bladder which was removed by the suprapubic method. The patient made a perfect recovery, and was free from all bladder symptoms for a period of over ten years.

About two years ago he again began to suffer from intermittent hæmaturia, which increased in frequency and quantity, and was accompanied by more or less pain on urination. His general health was well maintained. After a preliminary cystoscopy, which distinctly revealed the outlines of at least one large tumor, the bladder was opened above the pubes by Dr. Gibson on February 16, and its cavity was found to be almost completely filled with multiple growths, some of them as large as an adult fist. Some of these tumors were partly soft and very vascular, and they were removed as thoroughly as possible with the scissors and Volkmann spoon. A rubber drain was inserted, the bladder was left open and packed with sterile gauze, for control of the hæmorrhage, which was allowed to remain for forty-eight hours. The tube was removed at the end of four weeks, and the wound had practically healed at the end of seven weeks. He has had no pain nor hæmaturia since the operation, and the frequency from which he suffered had also disappeared, so that he could now sleep nine hours with-

out getting up to urinate. A recent examination of the urine showed that it was normal in color and acidity, and contained neither albumen nor casts. The growths removed from the bladder were submitted to a pathologist, who reported them to be villous carcinoma. After the primary operation by Dr. Keyes, the tumors were described as villous papilloma.

In reply to a question as to what the ultimate prognosis was in a case of this character, Dr. Gibson said that in all the cases of villous growths of the bladder that he had been able to trace, the tumors had in the course of time undergone the so-called malignant degeneration, and the patients had either died or were dying, not from the growths themselves, but from cystitis or renal complications. In this particular case there would probably be a recurrence within a year or two. In a case upon which he operated some years ago, and removed a tumor that almost completely filled the bladder, the man made a perfect recovery, and was free from symptoms for a year afterwards.

DR. ANDREW J. MCCOSH said he had been unusually fortunate in his operations on this unsatisfactory class of cases. He recalled the case of a man of sixty years, a physician from out of town, upon whom he operated nearly two years ago, and removed an epithelioma about the size of a walnut from the base of the bladder. He had recently heard from the patient's son, also a physician, that his father was enjoying excellent health and was fully able to take care of his extensive practice. Another case was that of a woman, a school-teacher, about fifty years old, on whom he operated thirteen months ago, and removed the entire bladder, which was extensively involved by a malignant growth. An inch or more of each ureter was removed, and the ends left loose in the retroperitoneal tissue of the pelvis. Since the operation, the patient had gained over thirty pounds in weight, and was still able to do her work as a teacher in one of the public schools. She wears a tube, which enters the pelvis through the vaginal vault, and the urine drains into a urinal worn against the thigh.

In a third case, Dr. McCosh said, the operation for a malignant growth of the bladder was done fifteen months ago, the ureters being treated in the same manner, and the patient was still, apparently, enjoying good health. Probably in all of these cases a recurrence would take place sooner or later, but the operation had given the patients a period of comparative comfort.

DR. F. KAMMERER said that about three years ago he had shown a patient, the greater part of whose bladder had been removed for malignant disease; two and a half years after the operation a recurrence took place, the patient dying shortly afterwards. One interesting feature of the case was that, despite the fact that only a small section of the bladder was left, its lumen was gradually increased until the man was able to hold about 200 cubic centimetres of urine.

GASTRO-ENTEROSTOMY FOR SEVERE HÆMATEMESIS.

DR. GEORGE E. BREWER presented a man, thirty-eight years old, a cab-driver, who was admitted to the Roosevelt Hospital in March, 1904, suffering from the effects of five severe attacks of hæmatemesis occurring within the previous five days. He gave a distinct history of gastric ulcer, extending over a period of several years. Of late, the pain after taking food had been very severe, and was almost invariably followed by vomiting a quantity of exceedingly sour fluid. The pain was located in the median line, about two inches above the umbilicus.

The first hæmorrhage came on spontaneously, without prodromal symptoms. The second occurred on the following day, when he vomited about one quart of dark, clotted blood. Three more hæmorrhages occurred in the next three days, which so prostrated him that he was unable to rise from his bed.

Upon his admission to the hospital, an examination of the blood showed 2,700,000 red cells, and 60 per cent. of hæmoglobin. His temperature was subnormal; pulse, 112. Under ether anaesthesia, a posterior gastro-enterostomy was performed with the Murphy button, the operation being completed in fourteen minutes. For three or four days following the operation he vomited small quantities of dark greenish fluid, but no fresh blood. The stools remained tarry in appearance for several days. The patient made a rapid recovery, and thus far there had been no return of the symptoms. The patient began to take food four days after the operation, and since then he had gained about twenty pounds in weight.

DR. F. KAMMERER referred to a case of malignant disease of the stomach in which there were repeated hæmorrhages, almost as severe and as sudden as those in the case reported by Dr. Brewer. The patient was in a most critical condition when posterior gastro-

enterostomy was done; but he recovered, had no further hæmorrhages, and lived for almost a year after operation.

DR. ERDMANN, who had seen the case in consultation before the patient's removal to the hospital, corroborated what had been said regarding the profuse character of the hæmorrhages, necessitating injections of morphine and strychnia and saline infusions.

DR. WILLIAM B. COLEY said that three or four years ago he showed before the Surgical Society a case of profuse hæmorrhages resulting from a duodenal ulcer. A gastro-enterostomy was done, and the patient was still in good health. In another case of gastric ulcer, with severe hæmatemesis, the patient was well one year after the operation, when she was lost sight of.

INTRACRANIAL NEURECTOMY FOR FACIAL NEURALGIA.

DR. BREWER presented a man, sixty-eight years of age, who had suffered for seven years from neuralgia in the second and third branches of the fifth nerve, on the left side. His sufferings had at times been intense. He had been under every kind of medical treatment without relief. For the past two years he had been under treatment at the Neurological Department of the Vanderbilt Clinic, and from there he was referred to the Roosevelt Hospital for operation on the ganglion.

As he had never experienced pain in the branches of the first division of the nerve, Dr. Brewer regarded the condition as due to a peripheral lesion rather than to disease of the Gasserian ganglion.

Under chloroform anæsthesia, the skull was opened as for the Hartley operation, the dura stripped from the base of the skull, and the foramina exposed. The second and third branches of the fifth nerve were then drawn upward with a blunt hook and severed close to the ganglion. A folded piece of rubber protective tissue was then introduced between the cut ends of the nerves and the foramina, and the wound closed in the usual manner. The patient made an uninterrupted recovery, and since the operation he had been entirely free from any recurrence of the pain.

Dr. Brewer said this was the third case upon which he had operated by this method, with entirely satisfactory results. In his first case, he was obliged to adopt the method as a make-shift; in that instance, an operation for the removal of the ganglion was

undertaken, but the hæmorrhage proved so severe that he had to abandon it.

DR. ERDMANN said he had removed the ganglion in three cases of inveterate facial neuralgia, and it was generally accepted that the seat of the trouble in this class of cases was in the ganglion, and not in the nerve-trunk.

DR. BREWER said that in cases where the symptoms were distinctly limited to one or two branches of the fifth nerve, it was justifiable to assume that the lesion was not a central, but a peripheral one. The operation he had described was much less formidable than removal of the ganglion. Personally, he had always held the view that in the obstinate cases, where all three branches of the nerve were involved, the lesion was in the ganglion.

FRACTURE OF THE SPINE.

DR. ROYAL WHITMAN presented a young woman who a year ago fell from a height of thirty feet. The only injury apparent at the time was a fracture of one leg, and after remaining in the hospital for six weeks she was discharged. She subsequently complained of pain and stiffness of the back, and an examination showed a marked angular deformity in the lower dorsal region of the spine, apparently resulting from a fracture of the vertebral bodies. A plaster-of-Paris jacket was applied, and the patient had entirely recovered so far as her symptoms were concerned, although the kyphosis still remained.

This case, Dr. Whitman said, was similar to the one he presented at the last meeting of the Society, and showed the comparative frequency of this form of compression fracture of the spine. It was often overlooked or unrecognized, but the diagnosis was important on account of its similarity to Pott's disease.

CLEFT PALATE.

DR. CHARLES N. DOWD presented a child to illustrate the Brophy method of treating cleft palate in very young children. The cleft was a very wide one, running up into the nostril. The operation was done when the child was nine weeks old, and consisted in dividing the bone above the alveolar border, and then passing a silver wire through each of the alveolar processes and

drawing them together very firmly. The wire traction sutures were left in for three weeks, and then had to be removed, as the child developed scarlet fever. There was still quite a gap left in the palate, but at least half an inch had been gained by the operation.

DR. WOOLSEY said he had tried the Brophy method in one case, that of a child perhaps six weeks old. In that instance he was enabled to bring the edges of the cleft together. The most difficult part of the operation was to pass the silver wires, as he had no suitable instrument at his command at the time for that purpose.

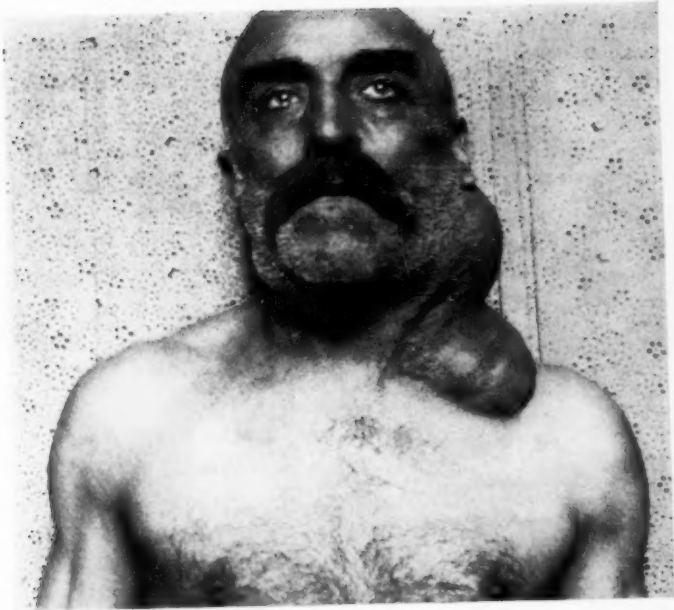
PERFORATING ULCER OF THE PYLORUS.

DR. JOHN F. ERDMANN presented a young man of twenty-three years, who first came under his observation four weeks ago. The symptoms he complained of seemed to indicate trouble in the region of the appendix, but through an exploratory incision that organ was found to be normal. A second incision higher up was followed by a gush of fluid resembling thin pus, and a careful search revealed a perforation, about the size of a 22-caliber ball, in the pylorus. This was closed first with a purse-string, followed by Lembert suture. The abdominal cavity was thoroughly irrigated and closed without drainage. The patient's recovery was uncomplicated, and he had since remained well.

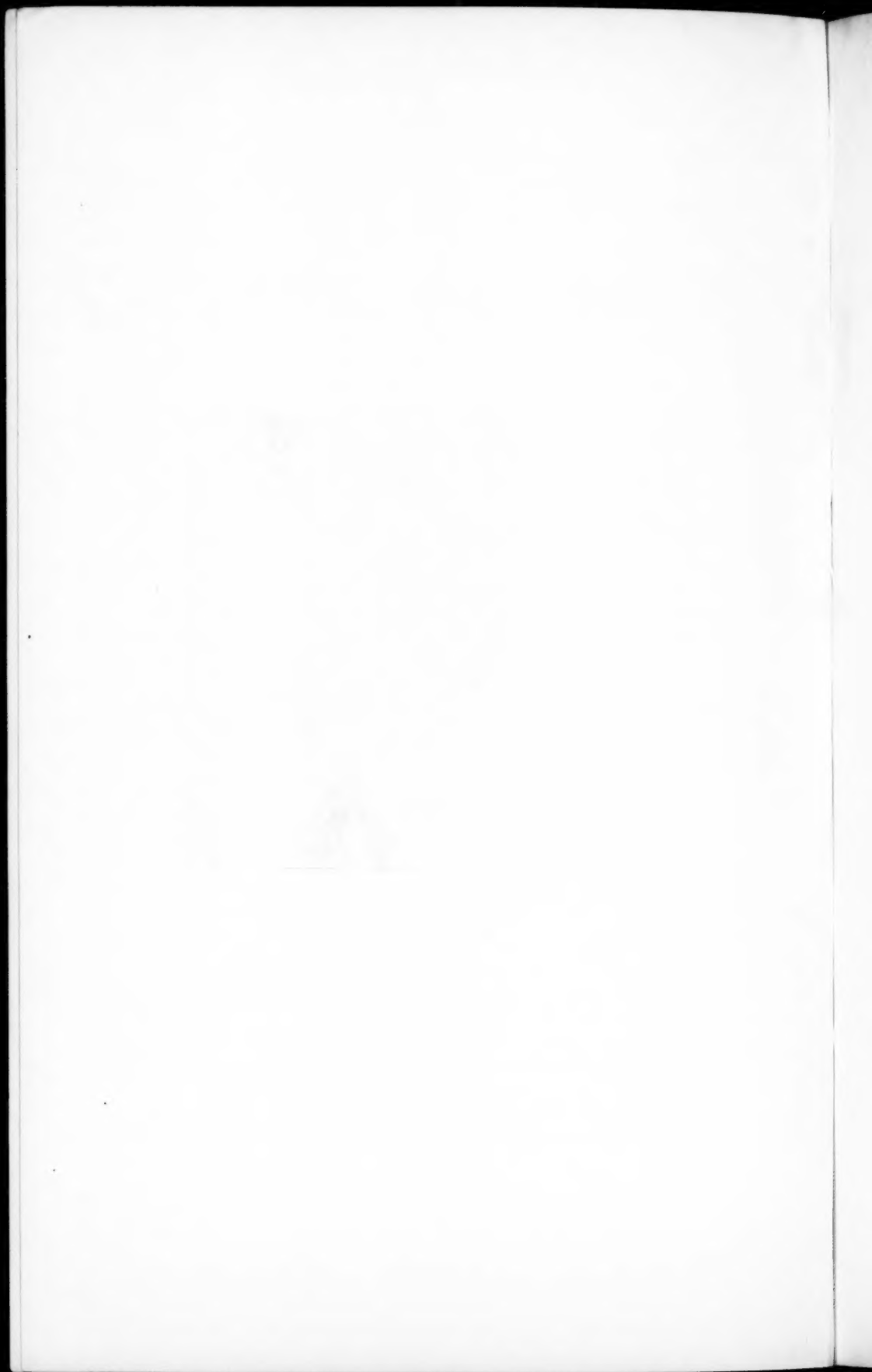
Dr. Erdmann said that of nine or ten cases of perforative ulcers of the stomach coming under his care, this was the first instance in which the patient gave a history of previous digestive disturbance. This patient stated that about two weeks before the occurrence of the perforation he had some pain in the region of the stomach, and that on one occasion he had vomited a small quantity of blood. On the day of the perforation he had drunk a large quantity of cold beer.

EXTENSIVE RECURRENT LYMPHOSARCOMA OF THE NECK

DR. FORBES HAWKES presented a man, fifty-four years old, who had an attack of rheumatism about fourteen years ago. Following this, he noticed a swelling on the left side of the neck, which rapidly increased in size. About six years ago he came under the care of the late Dr. Van Arsdale, who did a very radical



Lymphosarcoma of neck. (Hawkes.)



operation, removing the entire growth. In the course of his operation he cut through the internal jugular vein and had to resect a portion of it. In the course of a few months the growth recurred, and had now attained a very large size. A number of the glands on the opposite side of the neck and also in the groins were involved. (See Figure.)

The patient, who refused to submit to a radical operation, was now being treated with injections of Coley's fluid. The pathologist's report in this case was that the growths were lymphosarcomata.

DR. BREWER said the multiplicity of the lesions in this case, and their long duration, suggested Hodgkin's disease or some allied condition which had not yet reached the stage of profound anæmia. In Hodgkin's disease the lesions in the lymph nodes are often described as of sarcomatous nature, but they must not be regarded as identical with that exceedingly malignant and rapidly fatal form of disease called lymphosarcoma.

DR. KAMMERER said that the patient shown by Dr. Hawkes had been under the care of Dr. A. V. Moschcowitz, assistant surgeon to Mount Sinai Hospital, who had informed him that some of the growths had disappeared under the use of arsenic. The diagnosis of the case at that time was Hodgkin's disease.

DR. WILLIAM B. COLEY said he did not think it was uncommon to find metastases in the groins and axillæ in a typical case of lymphosarcoma of the neck. He recalled a case that began as a typical round-celled sarcoma on one side of the neck, and then involved the opposite side, then both axillæ and both groins, and finally there was general metastases, there being hundreds of tumors throughout the skin. Repeated examinations in that case confirmed the diagnosis of round-celled sarcoma.

DR. KAMMERER said he did not agree with the statement made by Dr. Coley that cases of true lymphosarcoma with metastases in the lymphatic glands were not uncommon. These tumors developed in one gland, grew rapidly, and finally perforated the capsule of the gland, invading the surrounding tissues. They generally recurred after extirpation, and are not amenable to medical treatment (arsenic) as some cases of Hodgkin's disease. Ulcerations, pressure on the œsophagus, trachea, and metastatic deposits in the internal organs are the usual causes of death. General invasion of the lymphatic glands was in his experience very rare.

DR. COLEY, in modification of his former statement, said that, while such cases were perhaps not common, they were occasionally met with.

REMARKS ON SARCOMA.

DR. ANDREW J. McCOSH read a paper with the above title, for which see page 161.

DR. COLEY said he wished to emphasize the statement made by the reader of the paper regarding the uncertainty of the microscopic findings in this class of cases. He recalled a case of a tumor of the parotid, followed by the development of two or three enlarged nodules behind the ear. One of these was taken out and examined by a leading pathologist of another city, and the surgeon in charge, relying upon this report that the growth was not malignant, advised against operation. The patient was put on potassium iodide, and after two months' treatment he developed metastases in the abdominal wall, with evidences of internal generalization. One of the growths in the abdomen was subsequently removed, and proved to be a rapidly growing round-celled sarcoma. In another case, seen a year ago, there was a small tumor of the cheek that seemed to be composed purely of fibrous tissue, and the pathologist reported that fibrous tissue so largely predominated, that the growth was of a very low grade of malignancy, if malignant at all. In spite of this favorable outlook, the tumor spread in all directions, metastases rapidly developed and proved fatal within four months.

As to the question of resecting long bones, or amputating through the joint, Dr. Coley said that depended largely upon what bone we had to deal with. In cases of sarcoma of the femur, he thought it was better to amputate at the hip-joint. In dealing with a periosteal sarcoma of the femur, no operation could be too radical. In dealing with malignant growths involving the tibia, however, such a radical operation might not be necessary.

The use of the erysipelas toxins, Dr. Coley said, should be limited to the inoperable cases, or to cases after primary operation as a prophylactic measure against recurrence. Of the cases in which he had employed the toxins, twenty-four had remained well for from two to eleven years; twenty-one from three to eleven years, and sixteen from five to eleven years. Four were of the round-celled variety, and three of them were inoperable sarcomas

of the parotid. Under X-ray treatment the speaker said he had seen a number of sarcomas disappear, but they rapidly recurred, usually within a few months; all of them in less than a year.

DR. ROBERT H. M. DAWBARN said that he would limit his remarks to a field not touched upon by the speaker of the evening,—the treatment of the region fed by the external carotid, by starvation of the malignant growths, in cases too far advanced to be extirpated. Dr. McCosh's excellent personal statistics in this region evidently refer only to cases not far advanced.

In Dr. Dawbarn's published essay upon this topic are given in detail more than fifty personal starvation operations,—a list long enough to enable one to reach certain conclusions. Chief of these is the striking difference in the value of the starvation plan as between cancer and sarcoma. In the former, no cases of permanent checking of the inoperable growth can be claimed. All who survived the operation done for carcinoma were temporarily checked, but such gain in longevity was only a few weeks to months. In sarcoma, however, the picture is much more favorable. Several cases are there recorded in full, in whom the shrunk growth has remained inactive for several years after the extirpation of the external carotids, and these cases remain shrunk; among them two of round-celled sarcoma, subperiosteal, of the lower jaw,—a type considered especially hopeless by Batlin in his work on "Malignancy." And in no case has a tumor been classed as malignant by the speaker except upon the evidence of an expert pathologist.

Dr. Dawbarn said that nearly a dozen members of this surgical society have now tried the starvation plan; but with a single exception these cases have all been carcinoma, not sarcoma. And apparently the failure to be of permanent benefit has discouraged these operators. In fairness to this new plan, it should certainly be tested in sarcoma; and the speaker asked for such tests and their results; remembering, however, that in a growth close to the orbit nothing favorable can be expected by starvation because of the free anastomosis there from the internal carotid.

In the one exception just alluded to,—an operation performed on a child at St. Luke's by a member of the Society,—the case has remained cured; and the pathologist pronounced the tumor sarcoma. But the operator, from its gross appearance, doubted its

being of this nature; hence Dr. Dawbarn has not claimed it as a sarcoma permanently checked.

Remembering the fact that carcinoma spreads through the lymphatic system, sarcoma through the arterial channels, mainly, one can readily comprehend why this starvation plan should prove much more hopeful in the latter type of malignant growth than in the former.

DR. WOOLSEY said he could corroborate what had been said regarding the difficulty of classifying tumors of the endothelial variety, both as to the group they belong to and as to their malignancy or non-malignancy. In a case of recurrent endothelioma of the parotid gland upon which he had operated nearly four years ago, and which he presented to the Society about a year ago, there were no signs of a recurrence up to the present time. Dr. James Ewing, who examined the tumor, stated at the time that he had not seen any other recurrent endotheliomata. In another case of tumor of the spinal cord which he removed a little over a year ago, the growth was pronounced by one pathologist a sarcoma of an indeterminate variety, and by another an endothelioma. Thus far there were no signs of a recurrence. As a class, Dr. Woolsey said, endothelial tumors seemed to be comparatively benign. The malignant changes that sometimes occur in fibromata were exceedingly important, and he could recall instances where the pathologist's report gave some indication that such changes were not unlikely to occur.

In connection with the question of choosing between excision and amputation in dealing with malignant disease involving one of the long bones, Dr. Woolsey referred to the case presented at a recent meeting of the Society by Dr. L. A. Stimson, where he had excised the upper end of the affected humerus, and left a comparatively useful arm. Such a procedure, however, could not be followed in the lower extremity.

RETROPHARYNGEAL SARCOMA.

DR. CHARLES H. PECK presented a specimen removed from a woman, thirty-one years old, who was admitted to Roosevelt Hospital on March 2, 1904. She was married and had borne three children; no miscarriages. With the exception of an attack of

mumps in childhood, her past history was unimportant, and she had always been strong and healthy.

About eight years ago, the patient noticed that her tongue was at times swollen, especially after talking; this swelling was only temporary in character and was not accompanied by soreness. About a year after the onset of this phenomenon the patient noticed a swelling about the size of a hickory-nut on the inner wall of the left side of the pharynx. This gradually increased in size, and in the course of two years the external tissues of the neck had become invaded. There was considerable dysphagia, and occasional neuralgic pains in the side of the neck and face. There was no tenderness on pressure.

At the time of the patient's admission to the hospital, an examination showed a large, globular mass on the left side of the neck, extending from the angle of the jaw to behind the ear. It was about the size of an apple, perfectly smooth and very tense. The mass was beneath the sternomastoid muscle and behind the masseter. The skin covering it was movable, and not reddened or tender. The carotid and facial arteries could be felt pulsate external to the mass.

Inspection of the throat showed a firm, smooth, rounded tumor involving almost the entire posterior pharynx. There was no facial paralysis; the orbit was not involved. Upon pressing the external growth, the internal one was observed to grow in size.

Operation, March 5, 1904, by Dr. Robert F. Weir. An incision, four inches long, was made over the tumor. It was found to be well encapsulated, and by blunt dissection it was freed from its bed and removed. The patient made an uneventful recovery, and left the hospital two weeks after the operation. The growth was submitted to Dr. Hodenpyl, who pronounced it a small spindle-celled sarcoma, showing evidences of marked degeneration.

RUPTURED BLADDER.

DR. F. TILDEN BROWN showed a bladder with a rupture in its posterior wall. This patient entered the hospital three days after the occurrence of the rupture. One interesting feature of the case was that, upon injecting the bladder with fluid, the exact quantity thrown in was returned. This was subsequently found to be due to the fact that the defect in the bladder wall had become sealed by adhesions. The patient died from general peritonitis.

INTESTINAL FORCEPS.

DR. JOHN D. RUSHMORE exhibited a forceps that he had devised for the purpose of facilitating the insertion of the Murphy button. He made the suggestion that the button could be more easily introduced partially closed than having each half introduced separately. The forceps is devised to accomplish this object. The smooth halves of the button in contact with the mucous membrane are sometimes quite insecure under the pressure of the thumb and finger when they are forced down against the purse-string suture with a pressure unsafe for the suture.

The instrument (made by Tiemann & Co., New York) consists simply of blades ending in sections of a circle to grasp the largest button. The circular ends are one-eighth inch wide, and leave room in the partly closed button for tightening the purse-string suture. A catch on the handle renders the instrument secure, and after each purse-string suture has been tied, the forceps can be easily removed and the button completely closed.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, April 4, 1904.

The President, HENRY R. WHARTON, M.D., in the Chair.

SEPARATION OF THE QUADRICEPS EXTENSOR FEMORIS TENDON FROM THE PATELLA.

DR. HENRY R. WHARTON presented a man, fifty-one years of age, who fell while walking and injured his right knee. He was unable to walk after the accident, and was treated for some weeks at his home; the nature of the treatment he received is not known. He applied for treatment at the Surgical Dispensary of the Presbyterian Hospital six weeks after the injury, and was referred to the Surgical ward.

Admitted to Surgical ward, May 29, 1903. Examination showed that he walked with difficulty, owing to weakness and loss of extension of the right knee-joint. It was found upon careful examination that there was complete loss of extension of the right knee, and a gap existed in the tissues just above the patella, due to a separation of the quadriceps extensor femoris tendon from the patella.

After the patient was anæsthetized, a longitudinal incision was made from the centre of the patella, which extended up the thigh for four inches. The upper portion of the patella and the lower portion of the quadriceps extensor tendon were exposed, and it was discovered that the injury was not merely a rupture of the tendon, but that the fibrous capsule of the patella over its upper surface had been torn off and drawn upward with the tendon, and that the lower portion of the capsule was separated from the bone by a layer of partially organized blood-clot and blood-

stained synovial fluid. The knee-joint also contained a considerable amount of blood-clot.

All blood-clots were removed from the joint and from the surface of the patella; to accomplish the latter object, it was necessary to curette the upper surface of the patella. The lower portion of the capsule attached to the patella was sutured to the bone by drilling the patella at the edges and in the centre, and passing chromicized catgut sutures through the capsule and drill-holes. The upper end of the patella was next drilled, and a heavy silver wire suture was passed through the lower portion of the tendon and through the drill-hole in the patella, and when this was secured the tendon was brought down in contact with the patella. It was considered wiser to drill the patella and use a heavy wire suture to secure the tendon to the bone, rather than to trust to sutures passed through the capsule, as the line of separation was irregular, and the edges of the capsular tissues were very much frayed. Portions of the capsule adherent to the tendon were next sutured to the lower portion of the capsule by a number of chromicized catgut sutures. The fascia was then brought together by a number of chromicized catgut sutures, and the skin and superficial tissues by a second layer of sutures. The wound was dressed with a sterilized gauze dressing, and the knee-joint fixed by a plaster-of-Paris bandage, including the foot and thigh.

The patient did well after the operation. The bandage was trapped on the twelfth day and the sutures removed, as the wound was found healed.

The fixation dressing was retained for six weeks, and after this time the patient was allowed to go about on crutches. He was discharged from the hospital, August 11, 1904, at which time the attachment of the tendon to the patella seemed to be firm, and he was regaining the motion of extension of the knee-joint.

At the present time he walks well and has fair extension of the knee-joint.

Dr. Wharton added that at a meeting of the Academy last year he reported a somewhat similar case, in which the patient had suffered from a simultaneous rupture of both quadriceps extensor tendons, in whom, six weeks after the injury, he exposed the seats of rupture of the tendons and sutured them, and the patient recovered with absolute restoration of function.

GALACTOCELE.

DR. W. W. KEEN presented a woman, aged twenty-one years, who was admitted to the Jefferson Medical College Hospital December 14, 1903. She had had a lump in her left breast almost as long as she can remember, and believes that it began about the time that her menstruation was first established at twelve to thirteen years of age. At first it was only about the size of a lady apple. She was confined March 8, 1903. When she was about three months pregnant, the tumor began to grow. At the time of her confinement, it was about twice as large as at the present time. After her confinement the tumor began slowly to shrink. The breast contained milk after her confinement, but the nipple was flat and retracted, and she did not nurse the child from that side.

When admitted to the hospital, the tumor occupied more than one-half of the left breast, involving all of the inner lower quadrant and parts of the two adjacent quadrants. It was ten centimetres in diameter, was rather firm, markedly lobulated, elastic, not attached either to the chest-wall or the skin. Apparently, the skin, however, is attached to the septa dividing the lobules. The nipple is flat but not retracted; milk can be expressed from the nipple. There are no glands perceptible in the axilla or neck. The urine is normal.

December 16 an elliptical incision was made, through which the entire breast was removed, but nothing more. The skin over part of it was so thin that, in spite of the utmost care, two of the smaller cysts were opened and their rich, creamy semifluid contents was discharged. A culture was taken from it, and the breast also was sent to Professor Coplin for examination. After its removal, it was found by section that the major part of it was one large galactocoele with a number of subsidiary cysts.

She made a perfectly smooth recovery, her highest temperature being 99.4° F. She was discharged one week after the operation with the wound entirely healed.

Practically the entire mammary gland was involved in the cystic change, the largest cyst being about six centimetres in diameter; many others being one or two centimetres. Examination of the milky fluid, which in some of the cysts was quite thick and creamy, showed it to be made up almost wholly of globules of fat, which gave the characteristic reaction of that substance with Sudan iii.

Professor Coplin and Dr. Ellis, by whom the specimen was examined, report that the microscopical appearances of the tumor after embedding and staining the sections with hæmatoxylin and eosin, hæmatoxylin and Van Gieson, Mallory's reticulum stain, toluidin blue and Weigert's elastic tissue stain, show some increase of the inter- and intra-lobular fibrous tissue, though this is not at all a prominent feature of the specimen. The most conspicuous change in the stroma is a marked periacinous infiltration of mononuclear cells, practically all of which are of the small, round variety. Similar, but less extensive accumulations are present around the ducts. Many of the acini and ducts show marked distention, several of the former having in certain instances coalesced to form cysts, some of which are of large size. These cysts are lined by one or several layers of cuboidal or slightly flattened cells and possess a fibrous wall which in many instances is quite thick. Some of the cysts are partially filled by large cells having a more or less deeply stained periphery, the interior of which is made up of granular material containing numerous small, transparent, circular areas that are apparently fat globules. In some of these cells the granules predominate, in others the fat globules are more numerous. Nuclei are present in some, being flattened and peripherally placed in those cells containing most fat. In addition to the distinct cells are large masses of débris evidently resulting from cell fragmentation. In some of the cysts there is distinct evidence that these large cells are in process of formation from the lining cells which increase in size, become globular, and finally show within them the presence of fat.

Sections stained for elastic tissue show no evident increase in that tissue, though there is possibly some splitting of the elastic laminæ of the blood-vessels.

To the diagnosis of galactoceles, Dr. Ellis, who made the examination, added "acute non-suppurative interstitial mastitis; slight chronic productive mastitis."

Dr. Keen said that he had reported this case of galactocoele, because in his experience it was extremely rare. He had amputated the breast fully 500 times in addition to seeing a large number of cases, probably 300 to 500 more, in which no operation had been done. This, so far as he remembered, was the only case of galactocoele that he had ever seen among these 800 to 1000 cases.

Almost all writers declare it to be rare; indeed, it is so rare

that in some cases he had found practically nothing beyond a bare mention of it.

As to the pathology, Ziegler ("Special Pathological Anatomy," American edition from the eighth German edition by MacAlister and Cattell, 1897, Section xiii, p. 1100) says, "When one of the ducts of a milk-secreting breast is occluded or partially obliterated by some previous disease, the part of the duct behind the obstruction occasionally but not very frequently dilates into a milk-containing cyst, known as a milk-cyst or galactocèle. It does not usually lead to inflammation of the surrounding tissue; but in some cases changes take place in the milk, and these excite inflammation and proliferation in the fibrous stroma. According to Küstner, the mammary tissue may even soften and break down into pulpy detritus from such inflammation."

Sometimes they are attributed to injury. Much more commonly they begin soon after confinement during lactation.

Dennis, in his "Text-Book of Surgery," quotes a case by Atlee which began sixteen months *before* the patient's confinement, and another from Bouchacourt, which began twenty-four years after her last confinement. Each of these cases clearly began independently of normal lactation. In the present case it seems probably to have had some connection with the tumor which developed at the time when menstruation first began, when she was twelve or thirteen years of age, and therefore about six or seven years before her present pregnancy. It is to be noted that a year after her marriage, she had a miscarriage at two and one-half months. She did not notice that that pregnancy had any effect upon the tumor, very probably because it was terminated by accident before the breasts became functionally active. She is an unusually intelligent colored woman and gave a very clear history.

The symptoms and diagnosis can be practically considered together. The appearance of the tumor is usually rather sudden, usually soon after parturition, or at least during lactation, without any inflammatory changes, and with only the pain and discomfort incident to the tension and weight. Some of these tumors become excessively large. Scarpa reports one in a patient just the same age as the one reported which occurred ten days after her confinement and from which ten pounds of milk were evacuated. Milk was demonstrated to be present in the breast of the present case by pressure upon the tumor, which caused the milk to escape from the nipple.

The tumor often varies in size, as was indicated in the present case. She stated that at the time of her confinement the tumor was twice as large as when she was admitted to the hospital. It had slowly shrunk after her confinement, doubtless from the absorption of the watery part of the milk.

The contents of such tumors varies extremely: sometimes it is like simple human milk; sometimes, when the watery parts have been absorbed, it is changed, as in this case, to an extremely rich cream almost as thick as castor oil. Gross states that they may be filled with what appears to be pure oil which coagulated into a substance resembling lard, intermixed with crystals of margarine. In other cases the contents are like butter or cheese. In other words, all or any of the various products from milk may be present.

As to treatment, sometimes aspiration or drainage is recommended. No tumor so large as the present one, and with so many independent cysts, could by any possibility have been treated by either of these means successfully. Moreover, as was seen by the more minute microscopical examination of Dr. Ellis, the entire breast was permeated with these cysts even in those parts which were not visibly enlarged. The determination, therefore, to treat it by amputation of the entire breast seems to be amply justified. If a galactoceles is incised and drained, especially if this is done during lactation instead of waiting until lactation is terminated, it is very apt to result in a milky fistula, or, if by any possibility infection takes place, an abscess of the breast develops.

DR. WILLIAM L. RODMAN said he had seen but one case of lacteal cyst, which occurred in a married white woman of twenty-five years. This case differed from the one reported by Dr. Keen, inasmuch as the patient had never borne children, and, so far as known, had never been pregnant. Instead of there being a single cyst, there were multiple cysts; some very small, others as large as a small walnut. The upper and outer quadrant of the breast was chiefly involved. Microscopic examination by Dr. McFarland showed that the tissue surrounding the cysts was the site of a marked interstitial mastitis. Before operation, the masses were so hard that the diagnosis of multiple fibromata was made. Removal of the entire breast was insisted upon and performed. Incision of the breast after removal showed the presence of milk, and no surprise was occasioned by the pathologist's report of galactoceles.

These cases are exceedingly rare, particularly in persons who have never been pregnant. They usually take the form of a single globular swelling behind the areola, due to the dilatation of a duct. Dr. Rodman agreed with Dr. Keen that the removal of the entire breast is the proper treatment in such cases as he had. Aspiration or even partial removal is not at all satisfactory in multiple cysts.

GASTROPLICATION FOR DILATATION OF THE STOMACH.

DR. W. W. KEEN reported the history of a man, aged thirty-one years, who was admitted to the Jefferson Medical College Hospital at the instance of Dr. Dunn, of Clifton Heights, Pa., on April 6, 1900. His father died of pneumonia at fifty-three; his mother and one sister are living and well; two sisters are suffering from pulmonary tuberculosis; his paternal grandmother died of cancer of the breast. He has never had any serious illness since childhood. He has used alcohol and tobacco in moderation. He states that he has had a weak stomach all his life, and for over a year has had a burning pain in the stomach below the ensiform cartilage, somewhat to the left of the middle line. Soon after taking food, the stomach becomes very sore, and the contents are often regurgitated into the mouth. He only vomits when the acidity becomes very great, and this is usually three to four hours after taking food. He has never vomited any blood. The gastric pain is not affected either by the taking of food or the vomiting of the food. He never remembers vomiting any food eaten one or more days prior to vomiting. A year and a half ago he weighed 210 pounds, his present weight is 180 pounds. His appetite is good, his bowels are habitually constipated, so that very often he does not have a stool for nearly a week. He has at times noticed dark material in the feces.

Urine clear, amber, 1022, acid, no albumen or sugar, urea 2.3 per cent. Heart, lungs, and the abdominal viscera were normal, excepting the stomach, which is markedly dilated.

Three days after he entered the hospital his stomach was washed out with sterile water; the contents were not offensive. A test meal was then given and free HCl found, but no lactic acid. On the next day, four pints of sterile water were introduced into the stomach before he complained of discomfort. After the stomach was emptied of the water, eighty-four ounces of air were

introduced through the stomach-tube before he complained of discomfort.

The greater curvature of the stomach lies a handbreadth below the umbilicus.

Operation, April 11, 1900. A vertical incision was made three centimetres to the left of the middle line; the stomach was drawn out and found greatly dilated. A forefinger was easily passed through the pylorus by invaginating the wall of the stomach. The stomach was then folded on itself by three rows of continuous Lembert sutures of silk, the last row of sutures bringing the greater curvature nearly up to the lesser curvature. The abdomen was then closed.

His highest temperature after the operation was 99.6° F. He was discharged from the hospital, May 3, in excellent condition. He could then eat food without regurgitating it, and the pain which he had noticed before the operation had entirely disappeared.

On account of an accident, he reported at the hospital again on February 25, 1904, nearly four years after the operation. His stomach has never given him the least trouble since the operation.

Dr. Keen remarked that the operation of gastroplication was of very recent origin. The first paper was by Bircher (*Correspondenzblatt für Schweizer Aerzte*, 1891, p. 713), and in this country independently by Weir (*Transactions of the American Surgical Association*, 1892, p. 149). This makes it desirable that we should know definitely the remote rather than the recent results of operation. Recovery, of course, by modern surgical methods is practically assured; but whether the operation will benefit the patient is quite another matter; hence he was glad, after the lapse of four years in this case, to report the final success of the operation in relieving the patient from all his discomfort.

DR. WILLIAM L. RODMAN believes that the so-called cases of atonic or myasthenic dilatation of the stomach are rare; very generally, mechanical obstruction at or near the pylorus is the etiologic factor. The operation of gastroplication has a distinct field, but modern research has made this a more restricted field than even five years ago. The case reported by Dr. Keen indicates that the operation was not only indicated, but completely successful in every way. Dr. Rodman believes that Moynihan's is perhaps the best method for performing gastroplication.

DR. LE CONTE said that on purely theoretic grounds the operation of gastroplication did not appeal to him as a reasonable mechanical procedure. When dilatation of the stomach exists without pyloric obstruction, it is due to gastropptosis with accompanying atony of the stomach wall; in other words, the gastropptosis preventing the complete emptying of the stomach, the food retained produced the atony of the stomach wall. Under such circumstances the dilatation would affect equally the anterior and posterior walls of the viscus. By gastroplication the anterior wall of the stomach is alone reefed up, lessening, to be sure, the size of its cavity, and at the same time bringing the greater curvature nearer to the lesser; but the posterior wall is not dealt with, and the dependent portion of the stomach is simply changed from the greater curvature to some point on the posterior wall. The case which Dr. Keen has reported shows that such an operation is sometimes followed by most excellent results; but it would seem to the speaker that the dilated and thin posterior wall would remain as a constant menace for the reproduction of the symptoms. To the speaker's mind, the ideal mechanical procedure would be to drain the most dependent portion of the stomach by a posterior gastro-enterostomy, in this way placing the organ at rest and permitting the muscular fibres of the wall to regain their tone. Gastroplication only in part overcomes the mechanical condition present. It decreases to a certain degree the size of the stomach, and at the same time elevates it slightly, but it does not place it at rest or increase the opportunity for development of its muscular fibres.

DR. JOHN H. GIBBON said he had assisted Dr. Keen in the case of gastroplication reported, and, though they expected to find obstruction at the pylorus, careful search revealed none. In cases of atonic dilatation the stomach increases in size because it is unable to empty itself; gastroplication relieves the condition by securing drainage. Such a large percentage of cases, however, are due to irritation, if not actual ulceration and obstruction, at the pylorus, that gastro-enterostomy is the operation of choice in most cases. For performing this operation, Dr. Gibbon has in three cases used the Doyen clamps with very satisfactory results. With these appliances, posterior gastro-enterostomy can be performed very rapidly; in his first case the entire operation occupied but thirty-five minutes.

DR. KEEN, in closing, said that absolutely no obstruction was

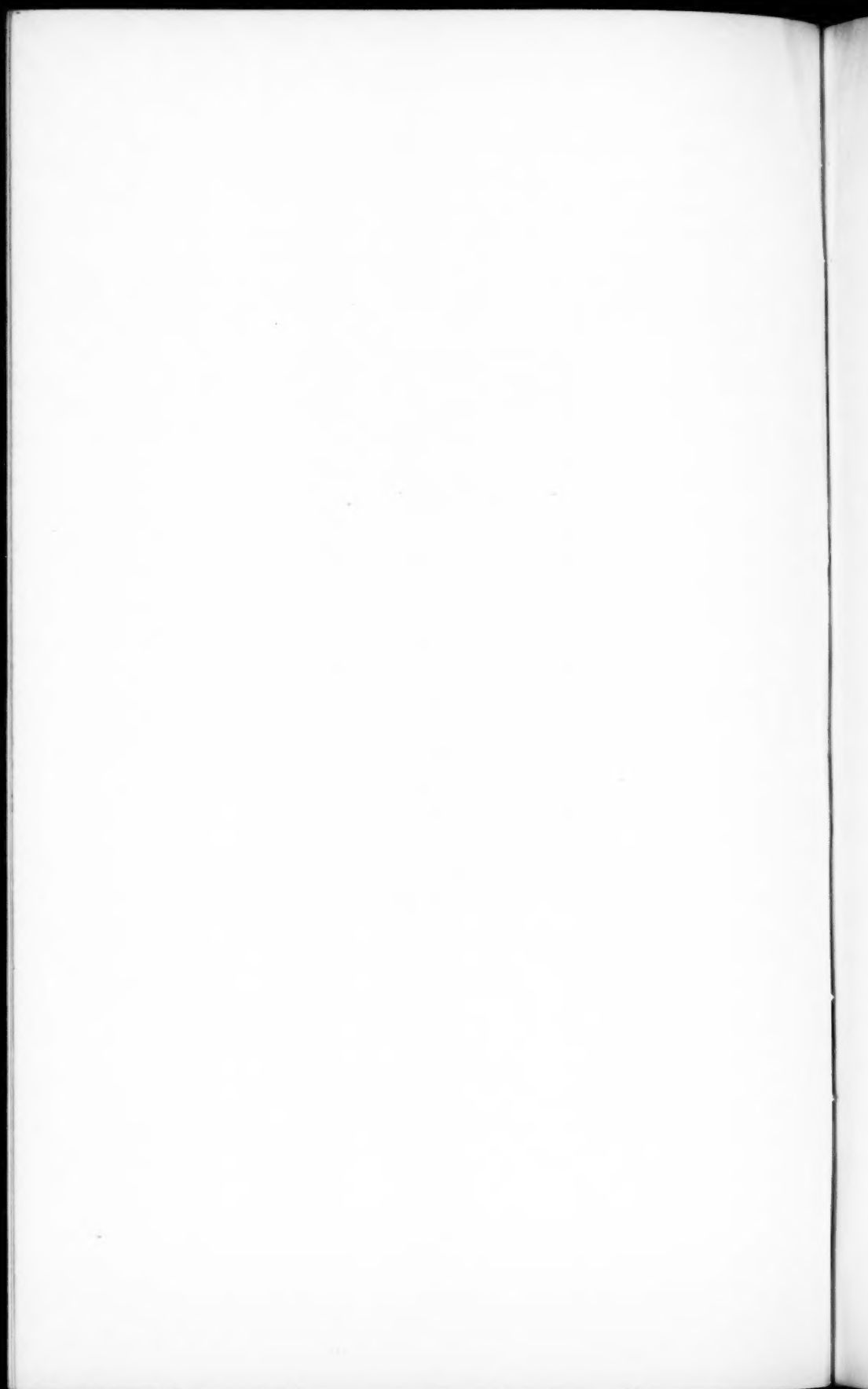
present in the case reported, the dilatation apparently being due to weakness of the muscular coat of the stomach. He did not understand the objection of Dr. Le Conte to gastroplication; that operation reduces the size of the stomach, shortening both walls of the organ. In some reported instances only one row of sutures has been applied at the junction of the greater and the lesser curvatures. He believes that the employment of three rows, the upper (and last) one at the lesser curvature, is better technique. The whole question regarding the value of the operation in the case reported is one of fact; the result, so far as relief of the patient is concerned, could not be better. This is the only instance in which Dr. Keen has employed gastroplication. In reply to a question by Dr. Roberts, Dr. Keen said that he did not know what change occurred in the mucous membrane of the part of the stomach that was turned up. Replying to Dr. Taylor's question as to whether he would at the present time perform gastroplication or gastro-enterostomy for dilatation of the stomach, Dr. Keen stated that he would employ the former method in case of dilatation not due to pyloric obstruction (Keen: Cartwright Lectures on the Surgery of the Stomach, *Philadelphia Medical Journal*, 1898, Vol. i). His attitude towards gastroplication is largely due to the success of the operation in the case reported, as the entire number of cases on record is not large. In the Cartwright Lectures in 1898 he had collected fifteen cases with one death. In cases of dilatation of the stomach due to obstruction he would not use gastroplication, but would employ either Finney's method of gastro-duodenostomy or posterior gastro-enterostomy.

A NEW METAL ANASTOMOSIS BUTTON BY JABOULAY, OF LYONS.

DR. W. W. KEEN exhibited specimens of Jaboulay's modification of the Murphy button. Dr. Keen believes that in two respects it is an improvement on the original: 1. The weight is considerably diminished; 2. Of equal or even greater importance is the fact that the caliber is decidedly increased. In buttons of the same external dimensions the Murphy pattern has a caliber of one centimetre, the Jaboulay of one and one-half centimetres. This, of course, greatly increases the carrying capacity of the appliance.



FIG. 1.—Fracture of metacarpal and subluxation. From boxing. Right.



SUBLUXATION AND FRACTURE AFFECTING CARPOMETACARPAL JOINT.

DR. GEORGE ERETY SHOEMAKER said that, five weeks after injury, a young man applied on account of a painful condition of the right thumb, due to an injury which had been produced in boxing with gloves by catching the point of the thumb. The carpometacarpal joint was partly dislocated, and on being reduced by pressure immediately assumed its faulty condition. There was a mild arthritis present with swelling and redness. Treatment had been neglected, and the joint had become exquisitely painful as a result. There was obscure joint crepitus on manipulation, but no bone crepitus. Use of the part in writing had become very painful and was followed by prolonged aching. The presence of fracture could only be proven by the X-ray, which demonstrated chipping off of a sharp longitudinal fragment five-sixteenths of an inch long from the inner edge of the condyle of the metacarpal bone. (Fig. 1.) The fragment was evidently within the capsule, and probably could have been adjusted by manipulation, or held in place by a dressing, if it had been seen soon after the injury. Treatment was directed to relief of the arthritis present and slow recovery ensued, though, owing to the interval before beginning treatment, splinting and strapping did not hold the fragment. For several months the joint was likely to become painful if used much. An X-ray photograph was taken eight months later, which showed the fragment still separated. Absorption no doubt would be the ultimate result. The condition of subluxation of this joint is one which is familiar to boxers. When, as in this case, chipping of the side of the bone has occurred, the joint is likely to be permanently weakened, as far as liability to repetition of luxation or subluxation is concerned.

In this case the same joint had been twice before injured slightly, but complete recovery from symptoms had taken place. The element of fracture was evidently a new one, as the angles of the fragment were very sharp. Though obscure bony crepitus might have been obtained soon after the injury, this is an instance in which the true condition would be impossible of demonstration without the X-ray.

FRACTURE OF THE LOWER END OF THE RADIUS.

Thin plate split from posterior surface into radiocarpal joint.

DR. SHOEMAKER presented an X-ray photograph, saying that it represented the left carpus of a woman aged forty-two. The injury resulted from a fall upon the hand. (Fig. 2.) There was severe pain at the wrist-joint, but no deformity and no crepitus. According to the photograph, a rectangular thin plate of bone in size approximately a half-inch by one inch has been chipped or split from the posterior surface of the lower end of the radius, and displaced by sliding about two lines towards the ulna, and the same distance upward. The fracture extends into the joint.

There was no transverse fracture, no silver-fork deformity; and firmly grasping the lower end of the radius while an attempt was made to move the upper fragment gave no crepitus and no preternatural mobility.

This fracture appears to differ from the rare Barton's fracture in that the smaller fragment consists of a thin layer of bone only, having the same width as the head of the radius. The thin character of the fragment is demonstrated not only by its translucent appearance in the photograph here shown, but by a second photograph taken three months later (Fig. 3), which showed no trace of the fragment where it had slid over towards the ulna. Absorption had apparently taken place. Recovery was accomplished with good motion, though pain was persistently present during the earlier weeks, probably due to the joint injury.

DR. GEORGE G. ROSS said that systematic X-ray examination of all injuries involving the joints is made at the German Hospital. Upward of 2500 are now on record, 1500 of which have been reported. Dr. Ross believes that the older ideas regarding the nature of sprains should be revised, as in the great majority of instances spicules of bone are torn off, converting the injury into a sprain-fracture. For this reason sprains should be treated as fractures. This method is employed at the German Hospital, and results in recovery without excessive callus formation and persistent pain, which are sequels of many cases treated only as ordinary sprains. A second point emphasized by Dr. Ross was that among the 1500 cases previously reported there were fifty-two of primary fracture of the carpal bones and a number of the tarsal bones. In his recent work, Scudder states that the scaphoid and



FIG. 2.—Fracture of left radius.



FIG. 3.—Three months after injury.

semilunar bones have each two centres of ossification. Dr. Ross does not agree with this statement, as special efforts have been made to determine that point; skiagraphs from both sides have been made in all cases of injury, and also in healthy children, and double points of ossification have not been found. Dr. Ross, in conclusion, urged the importance of systematically X-raying all cases of sprain.

DR. W. W. KEEN said there was a great deal of truth in the remarks of Dr. Ross, though he had not observed that fractures accompanied sprains so frequently as was stated. He mentioned a case of sprain-fracture of the inner malleolus of the tibia that could not have been diagnosticated by palpation (*Philadelphia Medical Times*, April, 1871); the fracture was discovered after the leg had been amputated because of other wounds. Dr. Keen believed that Mr. Callender first used the term "sprain-fracture."

DISLOCATION OF SEMILUNAR CARTILAGE.

DR. W. W. KEEN made a verbal report of this case. The patient was a young man of twenty, who, while playing basket-ball two and one-half weeks previously, had wrenched his left knee; since that time he could not straighten his leg beyond an angle of 135 degrees. Examination revealed marked tenderness over the internal interarticular fibrocartilage, and the joint was hot and painful. There was no effusion into the joint and no irregularity of the bones. The patient was anæsthetized with chloride of ethyl and attempts made to straighten the leg. Twice this was unsuccessful, but each time adhesions gave way. On the third attempt, reposition of the cartilage and the femur was felt, and the "snap" was distinctly heard. The leg could then be flexed and extended in a perfectly normal manner. This case is interesting because of the readiness with which the dislocation was reduced two and one-half weeks after injury. In this respect it was a rather unusual experience. [A week later the patient was seen and the knee was entirely well.]

GASTRO-ENTEROSTOMY FOR CARCINOMA INVOLVING THE STOMACH, OBSTRUCTING THE PYLORUS.

DR. ALFRED C. WOOD exhibited a specimen showing the result of a gastro-enterostomy sixty-eight days after the operation.

The patient was a man, aged forty-nine years, widower, white, blacksmith, born in Ireland. (University Hospital, No. 2377.)

His father, mother, one sister, and four brothers are living and well.

The patient's medical history was as follows: He had had measles, chicken-pox, and typhoid fever. For the past ten years he had suffered from dyspepsia and flatulence, which were frequently so bad that he could not sleep at night. About eight months ago his dyspepsia was distinctly worse and marked tympanites developed. He vomited his food frequently. About this time blood was frequently observed in the matter vomited and also in the stools. The abdominal distress became a severe pain, which was always aggravated by taking food. The symptoms gradually became more pronounced until about two weeks ago, when he began to vomit everything he ate. He has slept but little at night and is much reduced in weight. About twelve weeks ago he had hæmorrhages from both the stomach and bowel which lasted over a period of two weeks; during this time there were three profuse hæmorrhages. He had been six weeks and four days in another hospital in this city, having entered about the middle of May.

The man was exhausted to the last degree from the repeated hæmorrhages and his inability to retain any food. He was so feeble when he entered the University Hospital that walking required a distinct effort.

Examination of the heart, lungs, and kidneys did not show any gross lesions. The abdomen was scaphoid except in the epigastrium and upper part of the umbilical region, where there was a large mass that could be seen even from a distance. The long axis of the mass was transverse, the breadth being three or four inches and the length nearly twice as much. It was moderately tender on pressure.

August 8, posterior gastro-enterostomy after the method of von Hacker was performed, a medium size Murphy button being employed to economize time. A few Lembert sutures were added to make the union more secure. An entero-anastomosis was not performed. The wound was closed by through-and-through sutures.

The progress of the case after operation was all that could have been desired. Peptonized milk was allowed on the second day on account of the exhausted condition of the patient. On the

eighth day solid food was given, and a few days later the full ward diet was permitted, the appetite being very good. There was but a single attack of vomiting from the time of operation until the end; this was on September 24, forty-seven days after the operation, and was probably due, as the patient suggested, to over-indulgence in food.

The button was passed without difficulty on the twenty-seventh day. There was some increase of strength and vigor at first, but the improvement was not progressive. About October 10 the abdominal pains from which the man had been quite free returned. On the 12th he was quite weak, and vomited a little blood. On the 14th there was a moderate hæmorrhage from the stomach, and a very large amount of blood was passed by the bowel; the patient being severely shocked in consequence. The hæmorrhages recurred on the 15th, from which the patient died.

An autopsy was performed and the stomach and attached bowel secured. Owing to the large tumor mass and the universal adhesions, the specimen could not be removed satisfactorily, but was considerably mutilated. The stomach was distended with clotted blood. The carcinoma had eroded the wall of the stomach and had caused the fatal hæmorrhage. Numerous metastatic deposits were seen on making sections of the liver.

The specimen is of especial interest on account of the size of the opening between the stomach and intestine, which is quite twice the diameter of the button employed. The union is in every way all that could be wished for.

The question is frequently raised as to whether it is worth while to perform an operation on patients suffering from a malady that must end fatally in a short time. In the present instance the result fully justified the course taken. The patient was asked some days after the operation if he felt satisfied up to that time. He replied that the relief from hunger and the absence of pain and vomiting experienced during any one day fully compensated him for all the risk and inconvenience he had incurred.

TRANSACTIONS
OF THE
CHICAGO SURGICAL SOCIETY.

Stated Meeting, March 7, 1904.

M. L. HARRIS, M.D., in the Chair.

OSTEOMALACIA.

DR. THOMAS A. DAVIS read a paper with the above title, for which see page 225.

DR. BAYARD HOLMES said he saw the patient first as he was conducting the essayist's clinic, but failed to recognize the condition of the arm, except that there was a fracture in a man, who was so evidently sick that he attributed the fracture either to some pathological lesion, or the failure of the bone to unite to his condition, and he did not at any time think of the possibility of sarcoma or of osteomalacia.

DR. M. L. HARRIS said there were some interesting points in the case, and the most interesting to him were that the patient seemed to have recovered from the general condition in which he was apparently before the operation. Another point was that the albumose which was present in the urine previous to the operation had disappeared. This brought up the question of whether this was a general condition primarily, or whether it was a local condition primarily affecting the general system. If it were a general disease, one could hardly understand how, after the removal of a portion of it, all of the general symptoms disappeared. If it were a local disease, and limited to the part or area which was removed, it was easy to see how the removal of that part might result in relief of the general condition. The presence of albumose had long been recognized in osteomalacia. If it was due to the condition in general, he did not understand how the removal

of certain parts, as was done in this case, would result in the disappearance of the albumose. The question of local origin or a diseased condition limited to the points mentioned and infecting the general system seemed to the speaker very likely.

DR. DAVIS, in closing the discussion, said there were two points he had thought of since reading his paper. One was the patient insisted that within four days from the time the amputation was performed he was a different man, and that he was much stronger physically, and was able to get about the hospital. He no longer had the stiffness and weakness he formerly had. He thought this suggested the possibility of some locally generated toxic substance which was the cause of the man's myasthenia.

In relation to the myasthenia after the first exploratory operation for a few days, muscular function seemed little, if any, disturbed. Examination about a week later disclosed perfect sensation, but the patient could not contract the muscles. Dr. Davis said that myasthenia was generally spoken of by the authors who had reported cases, and, as the patient had perfect sensation, it would seem as if there might have been some trouble in the muscle itself which would account for the myasthenia, not of central, but of peripheral nerve origin.

Referring to the remarks of Dr. Harris, he stated that possibly the albumose might be the product of a large pathological area, and in diminishing that area by the removal of those parts which were most affected, leaving, as in this case, but few ribs which were still resilient and tortuous, there might be such a small quantity of albumose present as not to be detected in the urine. Albumose reaction might not be observed. This was the only other explanation, aside from the disease being a local one, with general manifestations, he had to offer.

NEPHRECTOMY FOR PYONEPHROSIS.

DR. FREDERICK A. BESLEY presented a man, forty-five years of age, who for a period of twenty years had suffered from repeated attacks of pain in the left side. He describes them as "cramping" pain in the back and left side of the abdomen, radiating to the testicle. Heat applied over the site of pain would relieve it. The attacks of pain seemed to be less frequent after the application of a truss to an inguinal hernia which he had.

In the year 1895, he was operated upon by Dr. McArthur.

At this time he was suffering from headache, photophobia, ataxia, dizziness, falling, and hemianæsthesia of the right side. The operation revealed a cyst in left lobe of the cerebellum. This was drained and the recovery was perfect.

The patient was referred to the reporter by Dr. H. M. Richter. He had been ill about two weeks before admission to the hospital, complaining of severe lumbar pain on left side, with chills and fever. The urine gradually decreased in amount. It contained albumen, casts, blood, and pus. About forty-eight hours before coming to the hospital, there was almost a complete suppression of urine; patient became delirious, and finally comatose.

He was admitted to the hospital, April 1, 1902, in the following condition: Semi-unconscious, pupils equal and responding to light; the skin was hot and dry; tongue heavily coated. His temperature was 104° F.; pulse, 134; respiration, 56. During the first twenty-four hours he voided 450 cubic centimetres of urine. It contained albumen, casts, blood, and pus. During the next twenty-four hours the amount of urine increased materially, and on the third day he voided 2000 cubic centimetres with a specific gravity of 1015; cloudy; alkaline reaction; urea, 1.5 per cent.; trace of albumen; numerous casts; some pus and blood.

His general condition improved rapidly until the fifth day, when he had a chill and his temperature went to 102.8° F.

At this time a small tumor could be felt in the region of the left kidney. His condition grew steadily worse, with gradual enlargement of the left kidney. Temperature was irregular and pulse high. Blood showed a leucocytosis, 12,500. On the tenth day it was decided to explore the kidney and evacuate the suspected collection of pus, although consultants advised against this procedure because of the almost hopeless condition of the patient. The Harris segregator was used, and showed the right kidney to be active, with no urine coming from the left ureter.

A very small amount of ether was administered, and an oblique incision parallel to the twelfth rib was made and the kidney quickly exposed. The organ was distended and fluctuating. A large forceps was inserted and about 500 cubic centimetres of pus evacuated. The pelvis was explored with the finger and found to be dilated, but contained no stone. A large rubber tube was used for drainage. The patient improved rapidly, but did not fully recover, there being evidence of a chronic sepsis. The lumbar

sinus remained open, discharging urine and pus. The left ureter did not become patent. The urine from the right kidney was practically normal.

This condition remained unchanged until June 28, 1902, when the kidney was removed through a lumbar incision. The patient made a perfect recovery. The urine at the present time is normal.

CLINICAL NOTES ON APPENDICITIS.

DR. BAYARD HOLMES presented the following cases:

(a) *A Buried, Erect, Vertical, Retrocæcal Appendix, with Appendicitis*; (b) *A Partial Appendicitis*; (c) *Ambulatory Treatment after Appendicectomy*; (d) *Two Unexplainable Deaths after Appendicectomy: One with Findings of Acute Yellow Atrophy of the Liver.*

SEVERE LACERATION OF THE ABDOMINAL MUSCLES.

DR. DANIEL N. EISENDRATH exhibited a man who he said was the victim of the new style of cars which were being used in Chicago. The old-style car left enough space, so that one could stand between two cars passing in opposite directions, whereas these sixty-foot cars left such a small space that there was not enough of room or space to protect oneself. The patient was admitted to his service at the Cook County Hospital on the first day of June, 1903. He and his companion were trying to get on a Wentworth Avenue car at Polk Street, and in so doing his companion was hit by a car coming in an opposite direction and brought to the hospital dead. The patient suffered great shock. He was seen about two hours after his admission to the hospital by the speaker. The interne (Dr. Snyder) at that time found over the crest of the ilium a tumor about the size of two fists, which was tympanitic on percussion, and which he could replace. Dr. Eisen-drath thought at first it was only a hæmatoma, but on being able to replace the tumor with gurgling, he agreed with Dr. Snyder that the diagnosis was a traumatic hernia through the triangle of Petit. Other injuries were fractures of the fifth and sixth ribs, with pneumothorax, and dislocation at the outer end of the clavicle. Patient did not give consent to operation that evening, but the next morning did so. The speaker made a large incision, which extended almost from the anterior superior spine of the ilium down to

the middle of Poupart's ligament. Much to his surprise, upon cutting through the skin he immediately entered the peritoneal cavity. He found the most extensive laceration of the abdominal muscles he had ever seen or had been reported, so far as he could learn. The skin itself was not contused or abraded. The injury extended so as to involve all the abdominal muscles, the external oblique, the internal oblique, the transversalis fascia and peritoneum, all being torn from the erector spinæ muscle down to the internal abdominal ring. In fact, everything was torn from the crest of the ilium to the outer part of Poupart's ligament. There were large pieces of omentum lying in the wound, with extensive contusion of the ascending colon and cæcum. He could not suture peritoneum to peritoneum, because he could not find where it was in the iliac fossa. At first, he thought of drilling holes through the ilium and bringing sutures through the perforations, but as this would take too long, he adopted the plan of using a mattress suture such as is used by Dr. E. Wyllys Andrews in the ordinary treatment of a case of inguinal hernia. He went through the gluteal fascia, and then with a mattress suture of kangaroo tendon sutured the muscles and brought them out again through the gluteal fascia, after which they were tied. He brought all of the muscles beyond the crest of the ilium. He used altogether fourteen sutures.

He exhibited the patient, believing that it would be more interesting to see the result than any description of the case which he might give. There was absolutely no recurrence of the hernia; no bulging at any point. The patient claimed never to have had an inguinal hernia before sustaining this crushing injury, but after the injury a left-sided inguinal hernia made its appearance, which was of considerable size.

CONGENITAL AND INFANTILE OMENTOCELE.

DRS. JACOB FRANK and WILLIAM T. ECKLEY read a paper with the above title, for which see page 204.